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A GRIDDED CLIMATOLOGY OF CLOUDS OVER LAND (1971–96) AND OCEAN (1954–97) FROM SURFACE OBSERVATIONS WORLDWIDE

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ABSTRACT

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Surface synoptic weather reports from ships and land stations worldwide were processed to produce a global cloud climatology which includes: total cloud cover, the amount and frequency of occurrence of nine cloud types within three levels of the troposphere, the frequency of occurrence of clear sky and of precipitation, the base heights of low clouds, and the non-overlapped amounts of middle and high clouds. Synoptic weather reports are made every three hours; the cloud information in a report is obtained visually by human observers. The reports used here cover the period 1971-96 for land and 1954-97 for ocean.

This digital archive provides multi-year monthly, seasonal, and annual averages in 5×5-degree grid boxes (or 10×10-degree boxes for some quantities in the ocean). Daytime and nighttime averages, as well as the diurnal average (average of day and night), are given. Nighttime averages were computed using only those reports that met an "illuminance criterion" (i.e., made under adequate moonlight or twilight), thus minimizing the "night-detection bias" and making possible the determination of diurnal cycles and nighttime trends for cloud types. The phase and amplitude of the first harmonic of both the diurnal cycle and the annual cycle are given for the various cloud types. Cloud averages for individual years are also given for the ocean for each of 4 seasons and for each of the 12 months (daytime-only averages for the months). [Individual years for land are not gridded, but are given for individual stations in a companion dataset.]

This analysis used 185 million reports from 5388 weather stations on continents and islands, and 50 million reports from ships; these reports passed a series of quality-control checks. This analysis updates (and in most ways supercedes) the previous cloud climatology constructed by the authors in the 1980s. Many of the long-term averages described here are mapped on our website: www.atmos.washington.edu/CloudMap/.

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1. INTRODUCTION

In 1986 and 1988 we published our first presentation of a global cloud climatology from surface observations (W86, W88). [References to our previous publications herein will be abbreviated with the first author's last initial and the year of publication, as indicated in the reference list.] Those data were provided in a digital database at that time (H88). Subsequently we produced an archive of individual cloud reports obtained from synoptic observations made (visually) from land stations and ships at sea (H99). To produce that database, specifically designed for cloud analyses, we selected from the available data sources only those reports that contained cloud information. We then applied numerous quality-control procedures which rejected reports we determined to be flawed. Significantly, to each report we added a variable that indicated the amount of sunlight or moonlight that was present at the time of the observation (H95). This made possible our subsequent analyses, and the present cloud climatology, for which observations made at night are used only if there was adequate illumination from either moonlight or solar twilight.

This report describes the digital archive of cloud climatological data prepared by analyzing the individual observations. Cloud averages formed from those observations are given on a 5-degree latitude-longitude grid (or on a 10-degree grid for some ocean data), with land and ocean data processed separately. For each grid box, this archive includes multi-year (1971-96 for land and 1954-97 for ocean) annual, seasonal and monthly averages for both day and night, and analyses of the first harmonic for the annual and diurnal cycles. For the ocean, seasonal averages for eight times per day and seasonal and monthly averages by year are given for the grid boxes; for land, these quantities were given for each individual station in the companion archive H03 (CDIAC NDP-026D).

Averages are given for total cloud cover, clear-sky frequency, and nine cloud types (compared to six in our old climatology). The cloud types defined here are made up of five in the low level: fog, stratus (St), stratocumulus (Sc), cumulus (Cu), and cumulonimbus (Cb); three in the middle level: nimbostratus (Ns), altostratus (As), and altocumulus (Ac); and one in the high level: all cirriform clouds combined ("Hi"). We also give the combined amounts of all low-level clouds and the combined amounts of all middle-level clouds. Cloud amounts and frequencies-of-occurrence are given for all types. The frequency given is the "actual" frequency of occurrence (not the "frequency of sighting"); the amounts given are the "actual" amounts (including estimated amounts hidden behind lower clouds) using the random-overlap assumption where necessary for As, Ac and Hi, and using the maximum-overlap assumption where necessary for Ns. In addition, non-overlapped amounts are given for middle and high cloud types, and average base heights are given for the low cloud types. [These concepts are discussed in detail in W86 and in H99 and are summarized below.] Also the frequency of precipitation (based on the 1982-91 data from H94) is included in this archive.

This cloud climatology supercedes our first climatology (W86, W88). More years of data are used here and the analysis procedures have been improved (e.g. screening of nighttime reports, more resolution of cloud types, and more scrutiny of stations/ships contributing).

Numerous abbreviations will be employed throughout the text that follows. Most will be defined in context or in associated tables. They are also listed in **Table 7**. **Tables 1-9**, required for understanding and use of the data, are grouped in the "TABLES" section. Figures are located in the "FIGURES" section, while supplementary tables and figures are in the APPENDIX. All users should read Sections 1-5, but in Section 6 a user need only read the subsections applicable to the particular quantities desired.

CAUTION: It is important to note the cautions described in the various sections below so as to avoid erroneous use of the data. For example, not checking the number of observations when required could lead to using unrepresentative values, and not checking for the "missing-value code" (a negative number) could lead to erroneous analyses.

2. THE SYNOPTIC CODE AND CLOUD-TYPE DEFINITIONS

Table 1 lists the cloud information, obtained visually by humans on ships or at land stations, contained in a synoptic weather report. These quantities, along with the station identification, latitude and longitude, and the time of the report, are the basic data used to create this climatology. Synoptic reports are made every three hours beginning with 00 GMT, though some stations and most ships report less frequently. Some stations report only every 6 hours (00, 06, 12, 18 GMT) or only during daytime. For ships, 88% of the reports are for the 6-hourly times. For the land stations contributing to this analysis, 57% of the reports are for the 6-hourly times.

Table 2 lists the cloud types analyzed for this climatology and provides their definitions in terms of the synoptic code as defined by the World Meteorological Organization (WMO, 1988) and as modified in H99 and used here. The synoptic code allows 27 cloud-type codes (9 in each of 3 levels); we group the code values into 9 types. Precipitation codes are also given in Table 2 because they are used in our definitions of nimbostratus and cumulonimbus cloud types. The synoptic code is the only system of reporting weather data that is used worldwide, thus providing a degree of uniformity for a global climatology. There are numerous national systems of recording cloud data at many more stations, but they cannot be converted uniquely to the synoptic code, so we do not use data reported in those codes. Ships from all countries report in the WMO synoptic code.

Fog is a special case. It is indicated not in the cloud group of the synoptic code but in the present-weather code (ww); ww code values 10-12 and 40-49 indicate fog. Low, middle, and high clouds may be reported even if fog is present; in that case we ignore the fog. However, if the sky is obscured by fog (N=9 with a ww code for fog; Table 2), we identify fog as the low cloud type with an amount (fraction of the sky covered) of 100%. This "cloud type" we abbreviate as "Fo" to indicate "fog, obscuring."

In contrast to our previous climatology (H88), we now distinguish between St, Sc and Fo in the low level, and between As and Ac in the middle level. Also our definition of Ns has been changed slightly (compare Table 2 here with Table 2 in H88). In preparation for the present climatology, we made separate maps for the frequency of occurrence of cirrus, cirrostratus, and cirrocumulus in the high level but found discontinuities at some international boundaries, indicating that reporting procedures were not uniform worldwide. Therefore we group all high clouds together in this dataset.

A brief history of the evolution of the synoptic code was given in W88. The synoptic code for cloud types was defined in 1929 but changed in major ways in 1949. The observing procedures for reporting cloud types in the 1949 code in various countries did not become consistent until about 1952, so we originally used reports from 1952 onward. Subsequently we found some further inconsistencies in the reporting of low cloud types and their base heights through 1953, so here we begin the ocean cloud climatology with 1954. [However, we do record averages for individual years beginning with 1952 for interested users.] A seemingly minor rule change in 1982 resulted in a "clear-sky bias" in the computation of the frequency of occurrence of cloud types (H99). Here we compensate for this bias (and a related "sky-obscured bias") but in different ways for land and ship data (Section 4.4.3).

3. DATA SOURCES

The data source for this analysis was the "Extended Edited Cloud Report Archive" (EECRA; H99), available from CDIAC as NDP-026C. Land station reports included in the EECRA were originally taken from the "SPOT" archive of the Fleet Numerical Oceanography Center (FNOC) for the years 1971-76 and from an archive of the National Centers for Environmental Prediction (NCEP, formerly NMC) for the years 1977-96. Those archives are maintained at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. Because of changes in procedures at NCEP, the NCEP data do not contain cloud-type information after March 1997. Thus this land climatology terminates with 1996 data. Reasons for not using land data prior to 1971 were given in W86. Other problems with these datasets were discussed in H99. For the ocean, ship observations in the EECRA were originally obtained from the Comprehensive Ocean-Atmosphere Data Set (COADS; Woodruff et al. 1987 and Worley et al. 2005).

Several features designed into the EECRA simplified the present cloud analysis. Synoptic weather reports were included in the EECRA only if they contained cloud information and had passed our quality-control procedures. The screened reports were then re-written to include additional information that was implicit in, but not directly recorded in, the original report. For example, reports in the EECRA contain derived overlapped and non-overlapped amounts for middle and high clouds (for reports with $Nh \leq 6$; this qualification allowed the random-overlap equation to be used with sufficient accuracy). Each report also contains the solar elevation, the relative lunar illuminance, and a flag indicating whether the illuminance criterion of H95 was satisfied. For the present climatology we used only those reports that satisfied the illuminance criterion ("light obs").

4. DATA PROCESSING

4.1. Selection of Land Stations

H03 describes in detail how the stations were selected to contribute to this climatology. Briefly, stations were selected (from the EECRA) if they routinely reported cloud-type data, had long periods of record, and made reports both day and night. The remaining unsampled land areas were then filled with available stations that did not meet those criteria. Thus 5388 of about 12,000 stations were selected for use. From those stations, only the reports containing cloud-type information were used (thus the number of reports used for low-cloud types is the same as the number used for total cloud cover). **Figure 1** shows the geographical distribution of these stations. These stations contributed 185 million reports to this analysis, of which 133 million were in daytime.

Even with these selection criteria, as our cloud analyses proceeded we discovered problems with data from some of the stations. Peculiarities of some of the station data are given in Section 7.

It is notable that, with the installation of the Automated Surface Observing System (ASOS) in the mid-1990s, most stations in the U.S. stopped reporting cloud observations in the synoptic code format around 1995 (Appendix H of H99) despite objections from the climate community (W91). As noted in H99, some other countries may now also be discontinuing synoptic reports (e.g. New Zealand) or including reports from secondary stations in the synoptic database (e.g. Australia).

4.2. Selection of Ship Reports

Because ships from the various countries can move all over the globe, ship data present a different set of problems from the land data. The EECRA included all COADS reports that included a value for total cloud cover. COADS gathered data from various "decks" (originally "card decks"). There were, for example, the "US Navy Ship Logs", the "USSR Ice Stations", the "Great Britain Marine", etc. There were also a number of decks of reports from buoys. We rejected buoy data because buoys cannot observe clouds. We also rejected the "Historic Sea Surface Temperature" (HSST) decks (years 1952-61) because cloud-type information had been deleted during the construction of those datasets. In addition, we found that a number of smaller decks contained large fractions of reports that were problematic in some way, so we rejected them. Bouy decks were already excluded from the EECRA; the additional 13 decks we excluded are listed below. By far the largest are the HSST decks.

Deck Number	*Deck Name*	*Years Affected*	*% of EECRs 1952-97*
150,151,152,155,156	HSST (no types)	1952-61	1.7
117	US Navy Hourlies	1952-63	0.01
197	Danish Marine	1952-55	< 0.01
666,667	Tuna Boats	1980-97	0.8
891	US NODC Surface Data	1952-76	0.2
895	C-MAN	1980-88	< 0.01
896	NMC Misc (rejected only if CL=/)	1980-97	0.4
999	ETAC	1967-69	0.05

During the present analysis we subsequently found that Deck 187 (Japanese Whaling) gave strange reports for DJF and MAM 1952-54. This and other peculiarities are discussed in Section 7 below.

Figure 2 shows the distribution of reports over the ocean for one season (MAM). A total of 50 million ship reports were used in this analysis, of which 37 million were made during daytime. Appendix A3 in H03 gave a plot of the number of observations versus year for land data; **Figure 3** here shows similar information for the ocean. Figure 3a distinguishes the number of observations for total, low, middle, and high clouds (using MAM as the example season). Of the 50 million reports used for total cloud analysis, 90% were usable for information about low clouds, 65% for middle clouds, and 54% for high clouds. Figure 3b shows the number of grid boxes (see Section 4.3) filled with a minimum of either 25 or 75 observations each year.

4.3. Grid Boxes

We divide the globe into grid boxes for which the various cloud quantities are computed. All land averages and some ocean averages are presented at 5-degree latitude-longitude resolution, with coarser longitudinal resolution toward the poles to preserve approximately equal-area grid-boxes. This is called the "5c" grid (see **Table 3**). Some ocean averages are given at 10-degree resolution on the "10r" grid (Table 3). This is the case for ocean averages for individual years because the number of reports is often too small to form averages at 5 degrees. [The designations 5c and 10r are defined to distinguish them from other hybrid grids we have used. We used the 5c grid in our earlier reports.]

Each grid box is assigned a number. The numbering begins at the Greenwich Meridian at the North Pole. The box numbers increase eastward in each latitude zone, and the zones proceed southward. The west and south borders of a box are considered to be within the box (90°N is also considered to be within Box 1). Box numbers provide convenient, shorthand reference to locations on the globe and are given in the data records of the archived data provided here. **Appendices A1** and **A2** show box numbers on the 5c and 10r grids. **Appendices B1-B4** provide Fortran subroutines for converting between box number and latitude/longitude.

4.4. Averaging Methods

We recognize that the diurnal cycle is an important element of climate and that many cloud types undergo large diurnal cycles. We therefore form separate averages for daytime (AvgDy; defined here to be 06-18 local time (LT)) and for nighttime (AvgNt; 18-06 LT). We call the average of day and night the "diurnal average" (AvgDN). To form it, our preferred procedure is just to average the day and night values together. This method gives equal weight to day and night values even though there are usually far fewer observations (obs) available at night because of our exclusion of reports that did not satisfy the sky-brightness criterion of H95. We required a specified minimum number of obs ("minobs" or "min") for both day and night to compute the DN average this way. If the minima were not met in any particular case, the DN average was computed simply from all available obs, regardless of time of day. A flag (the "averaging code" or "Acode") is associated with each DN average to indicate the method that was used to obtain the average. The Acode is defined in Table 7. If an average is not computed because the number of obs (Nobs) was too small, then a "missing value" code ("Mcode"; usually -90000) is assigned for that average. The formats for recording the averages and Acodes are discussed in Section 5. [Since both day-averages and night-averages and their Nobs are given in the archive, a user is free to obtain a DN average by a method different from the one used here. A user must also apply a suitable minobs to avoid obtaining unrepresentative values. Unrepresentative values have unfortunately been published by some users of our previous datasets because they implicitly had set *minobs*=1.]

4.4.1. Averaging total cloud amount and frequencies of clear sky and precipitation

The average total cloud cover (amount) for daytime or for nighttime within a grid box is simply the sum of the amounts from the reports contributing, divided by the number of reports. Similarly, the frequency of occurrence of clear sky (or of precipitation) is simply the number of occurrences divided by the number of reports. Cloud "amount" is the fraction of the sky-hemisphere covered by clouds.

The *precipitation frequencies* provided here were not computed for the years used in the present climatology but instead were obtained from an earlier dataset where we had already computed them. We summed the monthly-means-by-synoptic-hour (on the 5c grid over the years 1982-91) from the H94 archive (NDP-026A) and computed 10-year averages for each hour, then combined the hours to form day and night averages, finally averaging the day and night values to form the DN average. These precipitation data were not screened by the sky-brightness criteria because an observer does not need moonlight to determine if it is raining or snowing. Thus Nobs at night is larger (relative to daytime) for precipitation than for the clouds.

4.4.2. Averaging methods for cloud types

Frequency of cloud types. Because some reports contain total cloud cover but not cloud-type information, the number of reports available for low-cloud analysis (Lobs) will, in general, be less than the number of obs available for total cloud analysis (Tobs). Also because the sky may be overcast with lower clouds, the number of obs available for computation of statistics for middle clouds (Mobs) and high clouds (Hobs) will generally be less than the number of obs for low (or total) clouds (Tobs $\geq$ Lobs $\geq$ Mobs $\geq$ Hobs), as shown in Figure 3a. The *frequency of occurrence* (*fq*) of a cloud type within some level (low, middle, or high) is obtained as the number of observed occurrences of the type (NTy) divided by the number of reports in which cloud-type information was given for that level (Lobs, Mobs, or Hobs). Thus we implicitly assume that the frequency of occurrence of a high cloud, for example, is the same when the high *level* is not observable (because of lower overcast) as when it is observable. [Adjustments to this computed frequency, made to avoid known biases, are discussed in Section 4.4.3.]

Cloud-type amounts. Because the synoptic code allows reporting of only two amounts even if clouds are present at all three levels (Table 1), it is possible for the amount of a middle or high cloud to be indeterminate even if the cloud is visible. Therefore we compute an *amount-when-present* (*awp*) from the obs for which the amount can be determined ("number of computable obs", NC) and obtain the average cloud *amount* (*amt*) as:

$$\mathbf{amt = fq \times awp}. \tag{1}$$

Low-cloud amount is always given in a cloud-type report (as Nh), so it is not necessary to first compute an *awp* for low clouds, but doing so and using Eq. (1) does not change the computed average. Also, if adjustments to the frequency *fq* are needed (as with ship data; Section 4.4.3), this approach is convenient. Furthermore, *awp* is an interesting quantity in itself since it tends to be characteristic of a cloud type. For the upper clouds, there may be obs from which to compute *fq* but no obs from which to compute *awp* or *amt* (unless *fq*=0, in which case *amt*=0). The Nobs for *awp* is NC. The Nobs given in the data records here for *amt* is the number of obs used in computing the frequency. To avoid reporting unrepresentative amounts, we imposed a minimum (*mina*) on NC for reporting *amt*: *mina* = *min* × *fq* × 0.6, where *min* has a value that is specified for each File Category (Section 6). If *mina* was not met, the Mcode was entered for *amt*. As always, it is necessary to check for the Mcode when using the data.

Whereas AvgDN is computed as (AvgDy + AvgNt)/2 for amount and frequency, *awpDN* is instead computed as: *amtDN/fqDN* (if *fq*=0, then *awp*=Mcode). This preserves the relationship in Eq. (1) but, in general, *awpDN* computed in this way does not equal (*awpDy*+*awpNt*)/2. For example, if cumulus occurs frequently during daytime but rarely at night, then *awpDN* should be weighted toward the daytime *awp*, as this method ensures. The Acode supplied for *awp* does not represent the averaging method, which never varies, but does indicate the relationship between NC(Dy), NC(Nt) and a specified *min* as defined in Table 7.

As was true for *awp*, Nobs for base height (NC) may also be less than the number of occurrences of a type (NTy) because the height-code *h* (Table 1) is sometimes not reported. For *base height*, AvgDN was computed as the average of day and night averages weighted by the day and night frequencies of occurrence. If the number of day obs or the number of night obs was less than the specified *min*, then the average was computed as the simple average of all available obs. The associated Acode indicates the relationship between NobDy, NobNt and the *min*.

The _non-overlapped amount_ (NOL) of a middle or high cloud type is the amount actually seen by an observer from below; i.e., the amount not obscured by lower clouds. [Thus for low clouds, NOL=amt.] It is analogous to the quantity reported by most satellite-derived climatologies, where the amount reported is the amount not obscured by *higher* clouds. The sum of non-overlapped amounts is equal to the total cloud cover, whereas the sum of the actual cloud-type amounts reported in this archive is greater than the total cloud cover because of overlap. Because one can know that an upper cloud cannot be seen (NOL=0) even if one does not know, because of lower overcast, whether it is present, Nobs for NOL is larger than Mobs or Hobs. NOL was not given in the EECRA for obs with clouds reported present in three levels because the apportionment of the upper non-overlapped amount (N-Nh) between middle and high clouds cannot be computed. However, to include this class of reports in the present climatology (since those reports do contain valuable information), we apportioned (N-Nh) by reference to the average *awp*'s of the cloud types when they were computable. We used the following algorithm:

If middle cloud is Ac,	then	NOL(Ac)	= 0.7(N-Nh) and	NOL(Hi) = 0.3(N-Nh).
If middle cloud is As or Ns,	then	NOL(As or Ns)	= 0.9(N-Nh) and	NOL(Hi) = 0.1(N-Nh).

Using this approximation, NOL was computable in 99% of the reports. Only unusual reports, such as those for China in the 1970s (with C_L=0 and Nh=/; Section 7.2 below), did not contribute.

4.4.3. Bias adjustments for cloud-type analyses

To improve the accuracy of the random-overlap computation of *awp* (Section 3), while reducing the _partial-undercast bias_ described in W86, *fq* and *awp* for upper-level clouds (As, Ac, Hi) were both computed only from reports in which the coverage of a lower cloud layer was less than 7 oktas.

Because cases in which lower clouds obscure upper levels cannot be used to compute a frequency of occurrence of the upper cloud, our simplest computation of cloud frequency (Method A) assumes that the frequency of occurrence of an upper-level cloud type is the same when its level cannot be seen as when it can be seen. However, the occurrence of upper clouds may be correlated with the occurrence of lower clouds, so the frequency of Hi, for example, may be different in reports where the high level abstains (C_H=/) because of low overcast than in reports where the high level is visible. To test for a possible upper-level "_abstention bias_", W88 plotted the frequencies of occurrence of middle and high clouds against the *awp* of lower cloud and concluded that Method A was the best we could do for high clouds, but that an adjustment might be useful for Ac and As. That adjustment (Method B) assumes that the frequency of occurrence of an upper-level cloud type is the same when its level cannot be seen as when it can be seen with the lower cloud amount in the restricted range 3/8 to 6/8. This procedure was supported by the data, probably because a cumulus cloud field has a smaller *awp* than does stratus, and the frequency of occurrence of As or Ac is greater when the low cloud is stratus than when the low cloud is cumulus (W85). During the present analysis we looked at this issue again and found a significant difference between the two methods over the ocean but not over land (probably because the global average low-cloud amount over land is only 26%, compared to 55% over the ocean). We therefore use Method A for the land analyses but Method B for the ocean analyses.

In 1982 WMO made a slight change to the instructions for reporting in the synoptic code, which affected our analyses as discussed in W88 and H99. That change (WMO, 1988) instructs observers to set C_L=C_M=C_H=/ when N=0 (i.e., "If there are no clouds, then don't report cloud types."). Prior to 1982, stations (or ships) that normally reported cloud types entered zeros for the cloud type variables when N=0, while stations that did not normally report cloud types entered slashes. Thus these two types of stations or ships could be distinguished, and reports with C_L=/ ("abstaining") could be omitted from cloud-type analyses. But beginning in 1982, all reports of N=0 have C_L=/; this allows some stations to contribute a report *only* when the sky was clear, producing a "_clear-sky bias_," which would cause our computed frequencies of occurrence of all cloud types to be too low. We avoided this bias in our land analysis by selecting only stations that did normally report cloud types (H03). Since our ship data do not identify individual ships, for the ship data we computed a "clear-sky-bias adjustment factor" (AF0; H99) to correct the cloud-type frequencies. The computation requires both the frequency of clear sky and the "bias fraction" *fb* defined in Table 7. The AF0 will be small if CL rarely abstains (small *fb*) or if the sky is rarely clear. The sky is indeed rarely clear over the deep ocean, but it is frequently clear near land. Globally AF0 is a small correction for the ocean (about 1.003), with larger values in coastal regions, particularly in lakes and inland seas (see Section 6.1). Norris (1998) took a different approach, but with similar outcome, in deriving and applying equations to correct for this bias.

An argument similar to that for the case of N=0 can be made for the case of N=9 ("sky obscured"). The latter, however, is a consequence of the way we must handle cases of N=9 (Table 2), and not a consequence of the 1982 rule change. Thus the "*sky-obscured bias*" applies to all years. The sky may be "obscured" by fog or by precipitation. When N=9 we inspect the present-weather code (ww) to determine the cause of obscuration. If the sky is obscured by fog (ww 10-12 or 40-49), thunderstorm, or DRS (drizzle, rain, snow; Table 2), the cloud type is considered to be Fo, Cb, or Ns, respectively. A station that never reports cloud types would therefore contribute to cloud-type analyses only when N=9, producing the sky-obscured bias, which would increase the computed frequencies of Fo and Ns (Cb is only slightly affected by this) and cause the computed frequencies of other cloud types to be too low. Globally the "sky-obscured-bias adjustment factor" (AF9; H99) averages also about 1.003 for the ocean, again with larger values in coastal regions.

The documentation of H96 showed that the large values for AF0 and AF9 seen in lakes and seas are due to large values of the bias-fraction. [The H96 data archive (NDP-026B) has been superceded by H99 (NDP-026C), though some of the figures, tables, and discussions in the documentation to the data archive may still be useful.]

The *night-detection bias* was mentioned in the Introduction. This bias, resulting from the difficulty of surface observers to detect clouds or identify cloud types at night, was minimized by using criteria developed in H95 for selecting only "light obs" for cloud analyses. (See "light obs" and "sky-brightness criterion" in Table 7.)

5. DATASET CONTENTS AND DATA FORMATS

5.1. General

The cloud data provided in this archive are divided into 52 numbered "File Categories" (FC) as outlined in **Tables 4a and 4b**. The category divisions are based on the content of the data. The categories are named and given abbreviations intended to be suggestive of the content. Thus, for example, Category 1 contains the latitude, longitude, and land-fraction of the grid boxes used (BLLF), and Category 2 contains mean annual cloud amounts for land data (LMAA). [As in our previous databases, the multi-year means are called "mean seasonal," with the letters MS in the file name; the means for individual years are called "seasonal means," with letters SM in the file name.] Land and ocean data are filed separately, except in FC_11, where seasonal and annual averages for land and ocean are combined on a single grid, using area-weighted averages in boxes that have both land and ocean. Land data are all given on the 5c grid. As will be described further in Section 6.1, the 5388 land stations we use are contained in 820 (of 1820) 5c boxes. The archive contains land data records for those 820 boxes only. Similarly, for the ocean there are 1502 grid boxes on the 5c grid and 404 (of 456) on the 10r grid. When land and ocean averages are combined, as in FC_11, there are data records for all 1820 boxes on the 5c grid.

Various multi-year averages are given in FCs 2-24. FCs 25-40 and 41-52 contain seasonal or monthly averages for each individual year; these can be used for analyses of trends for the ocean. For land, seasonal and monthly means for individual years were given in the companion archive (NDP-026D, H03) for individual stations, rather than for grid boxes, so that trends could be evaluated without biases that may arise when using data from more than one station within a box. Our survey of changes in cloud cover and cloud types over land (W07) used those data.

5.2. Details of Organization

Each file of FCs 1-19 and FC 24 (see Table 4) contains one or more "map groups" (MGRPs). A map group consists of the data records for a number of grid boxes over the globe (from which a map of some variable could be made) and a header record that identifies the group:

```
| Header record identifying map group
|    Data record for first box
|    Data record for second box
|    etc. for number of boxes specified in header
```

Some files (FCs 20-23, 25-52; see Table 4) list more than one data record for a box and are here referred to as "box groups" (BGRPs):

```
| Header record identifying box group
|    nn Data records for first box
|    nn Data records for second box
|    etc. for number of boxes specified in header
```

The value of "nn" depends on the file category. For FCs 20-23 nn=8, providing data records for each of the 8 synoptic hours for the grid box, while for FCs 25-52 nn=44 (or 46), providing data records for each of 44 or 46 years (1954-97 or 1952-97). The number of boxes in a group depends on the grid size and whether land or ocean data (or both) are being displayed.

Table 5 (a & b) is a more detailed version of Table 4. It indicates every individual map group (or box group) by listing a file-sequence-number (FSN) for each group within a File Category. For example, in FC_03 (LMSA) the first data records given are for total cloud cover over land on the 5c grid for DJF, while the amount of Ac cloud for JJA will be found in the 33rd group. This listing, along with the data formats described in the next section, indicates all the data provided in this archive. The FC number and the FSN are combined to give a unique sequence number to every data group (DGRP; map group or box group) in the archive; thus DGRP (MGRP or BGRP) = FC × 1000 + FSN. The sequence number is the first variable in the header record, as indicated in Formats 120 and 220 in Table 6 described in the next section. In addition to the DGRP, the header record contains other information that uniquely defines the group contents.

While there are 14 defined "types" (including precipitation) listed in Table 2, some quantities are not applicable to all types. For example, there is no "amount" for clear-sky frequency, so Cr, which appears in FC_04, does not appear in FC_03. Thus for most files only a subset of the 14 types is given; these subsets are listed in a footnote to Table 4.

Physical files. The size of the entire archive is about 232 megabytes. Some file categories contain a fairly large amount of data (Table 4). For this reason and for convenience of handling, they are physically divided into smaller files. The resulting files are given names that indicate their contents. The names contain the File Category number, the category name abbreviation, and several name extensions to indicate the season and/or cloud type(s) whose data group(s) is (are) contained in the file. The 1625 DGRPs in the 52 File Categories are contained in 708 physical files. A complete *list of the physical file names* is given in **Appendix F**. The means for obtaining the files are available from CDIAC (Section 8). Examples of the contents of the files are given in Table 8 and will be discussed in Section 6.

5.3. Data Formats

A *header record* precedes a sequence of data records in each data group (Section 5.2). Formats used for header records are shown in **Table 6a**. Although three are listed in Table 6b (Formats 110, 120 and 220), they are all basically the same. Format 110 simply shows that some variables are always "missing" when the format is used in FC_01, and Format 220 has the two extra variables MIN and VX, which are described in Section 6. The header record defines the content of a data group by specifying the parameters TYPE, PCODE, YEAR, SN and FMT, and it indicates the grid size (GRID) and number of grid boxes (NBXS) for which data records follow, and whether the data are for land or ocean (LO). Only numerical values are included in the header record, so the various cloud types, seasons, etc. are given numerical codes. These codes and their equivalencies are listed as values under the respective parameter name in Table 6a. (Definitions of cloud types are given in Table 2, and other terms in Table 7.) Each header also has a unique DGRP number which indicates the file-category number and the sequence number of the group within the file category (described in Section 5.2). The format number (FMT) given in the header record indicates the format (Table 6b) to be used for reading the data records. MIN and VX give information about the minima used for computing an average (Section 6).

The *data record formats* used are defined in **Table 6b**. The format of a data record depends on the category of data given. Categories 2-9, 11-19 and 25-40 (formats 121, 122, 226, 227) all have similar content. The grid-box number (BOX, which is the first variable in every data record) is followed by three pairs of numbers. Each pair is made up of a number of obs (or the number of seasons for Category 2, Category 12, and the annual part of Category 11) and an average (which may be for amount, frequency or height). The first pair gives daytime values (NobDy, AvgDy), the second pair gives nighttime values (NobNt, AvgNt), and the third pair gives the total number of obs and the average over both day and night (NobDN, AvgDN). Finally, the ACODE is a coded message providing information regarding NobDy and NobNt used in obtaining AvgDN (described in Section 4.4 above). Format 122 differs from Format 121 only in that the variable formatted is height in whole meters (F6.0) rather than amount or frequency in hundredths of percent (F6.2). Format 226 is similar to Format 121 except that averages are given for each of 46 years for each box, and the year (YR) is included. Again, Format 227 gives height rather than amount or frequency. Data lines in Categories 20-23 (Formats 138, 139) contain only a single data pair (Nobs and Avg for an individual synoptic hour) but 8 such pairs are given consecutively for each box. The synoptic hour (GMT) is included in these data records. Format 162 is unique in that it contains amount, frequency and amount-when-present in the same data record. It is used for Categories 41-52, the daytime averages for 44 years (monthly). It contains NC (the number of obs used in computing *awp*) as well as the Nobs used for computing frequency. Formats 140, 148 and 149 (used in Categories 10 and 24) give the parameters of the first harmonic of either the annual or diurnal cycles. Details and examples of format usage are given in Section 6 for the particular file categories.

All data appear as integers (the "I" format) in the data files. To indicate the number of decimal places to which some values are given, the "F" format is shown above the relevant variables in Table 6b. For example, the integer "1234" should be read as "12.34" if read under Format 121 (F6.2) or as "1234." if read under Format 122 (F6.0). If read in this way, amounts and frequencies are given in percent and base heights are given in whole meters. This principle applies to other variables in other formats as well.

6. SPECIFIC COMMENTS ON THE DATA FILE CATEGORIES

Section 6 contains eleven subsections. The user need only read the subsections that describe the file categories desired. Refer to Tables 5 and 6 (for file contents and data formats, respectively) throughout these discussions and to Table 7 for expanded definitions of many of the terms used. The discussion of an individual file category includes comments on the data content, data format and minima applied. Examples given in **Table 8** will be used as an aid in describing the major characteristics of a file category. **Table 9** will be used to show the minima used in computing the various averages and to show counts of the number of boxes meeting the minima for representative cloud variables. **Table 10** lists global averages for the various cloud types for land and ocean.

There are some minor differences between the land and ocean files. Some of these differences (e.g., in the minobs values used) are due to the different nature of ocean and land data. Other differences are due to the fact that the land data were processed first, and then some improvements were decided for the ocean analyses. For example, we decided for the ocean to compute the diurnal cycles of base height, which we had not done for land data.

6.1. File Category 1: Grid Box Information (BLLF); and Ancillary Ocean Files

Files of *Category 1 (Format 115)* provide information about the grid boxes on the 5c and 10r grids (Table 6b). The center latitude and center longitude of the box are given in degrees (-90° to 90°N, 0° to 360°E) to two decimal places (cLat, cLon). The land fraction for the box was obtained in 1980 from U.S. Navy topographic data (W86) with a resolution of 10 minutes (one-sixth of a degree). Thus a 5×5-degree box with less than 0.11% land, or a 10×10-degree box with less than 0.03% land, will appear here as 0%. The format also includes the number of land stations used (NStB, Table 7) and a code value (LOB) to signify whether a box contains land-only, ocean-only, or both land and ocean. Example (a) in Table 8 illustrates these features. Box 1 surrounds the North Pole and contains no land (FrL=0, LOB=2), whereas Box 1820 surrounds the South Pole and contains no ocean (FrL=100% and LOB=1). One of the 5388 land stations used for this climatology is contained in B5c 1820 (NStB=1). Box 252 contains both land and ocean (LOB=3) with a land fraction of 21.96%. Box 1316 contains less than 0.11% land (FrL=0) but does contain a small island with a weather station on it. The LOB code "12" is used for this situation. The negative value for NStB is a code signifying that the station had either a short period of record or made observations mostly in the daytime (Section 4.1). Lakes and inland seas (and the Antarctic ice shelves) were considered to be "land" in determining the land fraction. To allow ships in large lakes to contribute, the code LOB=21 (with FrL=100%) was created. Box 246 is an example of this. The negative value for LOB in this box, and also Box 250, signifies that the sky-obscured bias or the clear-sky bias is large, so the ship data in the box should not be used for cloud-type analyses (Section 4.4.3). A map of the LOB codes on the 5c grid is given in **Appendix C**.

6.1.1. Ancillary Ocean Files: Report Density in Time and Space (B10NYRS)

The Ancillary Files (Format 211; listed at the end of Appendix F) show, for each 10r grid box for each month (and season), the number of years for which there were at least 20 (or 25) ship obs, and the span of those years. This information is given for daytime obs, nighttime obs, and DN (years with Acode=2). Example (b) in Table 8 shows selected box data for MAM. The header record (Format 220) indicates that data are counted over the years 1952-97 (see Section 6.9) and that the *min* used here is 25 obs per year. Thus box 253 has at least 25 daytime obs in 45 years (yd) that span 46 years (sd), while at night only 20 years (spanning 30 years) have the minobs. The number of years for DN usually matches that for night because there are generally fewer obs at night. The years contributing to these data are 1952-97. This example also shows that the maximum number of obs in Box 253 for daytime in any year (mxob) is 248. Box 31 (the North Sea) contains more obs than any other box. On the other hand, Box 61 (containing very little ocean area) has minobs in only 2 years and only for daytime. Those two years are 1952 (yf) and 1953 (yl). One of these years has 43 obs in daytime; the other has fewer. [These years do not contribute to our multi-year climatology, which uses data beginning 1954.] Box 60 is 100% land so has no ship obs. Box 129 has 12 years with at least 25 obs in daytime, spanning the 40 years 1952-91, but has no such years at night. There is a maximum of only 61 daytime obs in any year in this box. To give an idea of the extent of global coverage for computing cloud trends over the oceans, there are 314 boxes (of a possible 404) that have a minimum of 25 daytime obs in 20 or more years (of 46 years total) for MAM. For DJF there are 330 such boxes, while for JJA and SON the numbers are smaller (304 and 305), mainly because of the reduced shipping in the Antarctic sea-ice zone during winter and spring. There are fewer boxes for nighttime. [These represent the maximum number of boxes available since one would most likely want to use a minobs of more than 25 for an individual season of an individual year.]

For the monthly files (Example c), obs are counted over the 44-year period 1954-97 using a *min* of 20 obs/year, as indicated in the header record. Note the few obs in Box 453 in April, compared to MAM in Example (b); most obs in this box (cLat= -75) during this season were made in March of just one year (1992). For the land, similar information was given for each station in File 01_STID in the companion archive NDP-026D (H03).

6.2. File Categories 3-5, 13-15: Multi-year Seasonal Amount, Frequency & Amt-when-present (LMSA, LMSF, LMSW, OMSA, OMSF, OMSW, O10W)

Categories 3-5 and 13-15 (Format 121) contain the “mean seasonal” (multi-year) averages for cloud-type amount, frequency and amount-when-present for land and ocean grid boxes separately (Tables 5a and 5b). The tables show that cloud-type amounts summed over the low and middle levels (LoL and MiL) are also included in FCs 3 and 13. FCs 5 and 15 do not include *awp* for total cloud cover (TC), for which none is computed, or for Fo (sky obscured by fog) which is, by definition, always 100%. Also note that Fo is included in FCs 4 and 14 (frequency) even though fq_Fo = amt_Fo. Land and ocean data are given on the 5c grid. Ocean data are also given on the 10r grid for *awp* in FC_15, with the file abbreviation O10W. [Ocean multi-year mean seasonal amount and frequency on the 10r grid are contained in FCs 18 and 19 which are discussed in Section 6.7.]

The averages in these files were obtained by summing, seasonally, all obs over all the years for each box; they were not obtained by averaging the season averages of individual years. Nobs for *awp* is NC, the number of occurrences of a cloud type for which an amount was computable. (For low clouds NC=NTy; for upper clouds NC is generally less than NTy.) The Nobs given in a data record for amount is that used for frequency, though *amt may be missing for middle or high clouds (assigned the Mcode)* if NC is inadequate (NC < *mina* as described in Section 4.4.2).

The above situation is illustrated in Example (f) of Table 8 for Box 773. From Example (d) we can see that fq_As for land Box 773 in DJF is only 0.60% at night. There were 168 reports of the middle level, so there was only one occurrence of As in this case (0.006 x 168 = 1). But from Example (e) we see *awp* could not be computed from that occurrence (NC=0). Thus amt_As here is missing at night even though 168 obs are listed. This way of displaying the data gives the user some information (there were 168 obs) but requires that the *avg* variable be checked against the missing-value code to avoid erroneous results.

The minima used for computing and displaying averages are shown in Table 9, which lists some header records selected from the various file categories. For the ocean data the minima are actually included in the header record (fmt 220); for the land they are not (fmt 120) but they are listed here with the header record in Table 9. In FCs 3-4 for land the table shows that *min*=100, meaning that the minobs for computing AvgDN with Acode=2 (Section 4.4) is 100. In addition, the *vx*=1 tells us that an average is given even if there was only one observation (though the Acode will be different). Box 261 in Example (d) of Table 8 is a case with thousands of obs both day and night and an Acode=2. Box 1777 in that example has only 96 obs at night, so Acode=3 but AvgNt is also given because *vx*=1. For ocean boxes in FCs 13-14, *min*=100 for TC, Cr, and Pt, but only 50 for the cloud types. For Pt here, *vx*=1 as it is for land data, but *vx*=25 for TC and Cr (50 for types), meaning that an average variable will be assigned the Mcode (and Nobs set to zero) if there are less than 25 obs (50 for types). Box 549 in Example (g) shows this situation. There are 69 daytime obs but only 19 at night (88 total); thus AvgDy is given, AvgDN is given with Acode=3, but AvgNt is missing (with NobNt set to zero). This procedure reduces the possibility of using unrepresentative values. It is more of a problem with ocean data than with land data because there are fewer ship obs, and they are from diverse sources, and some reports are mislocated (Section 7).

Minima for *awp* in FCs 5 and 15 are 50 for land and 25 for ocean (Table 9), with *vx*= 1 and 25, respectively. Examples (h) and (i) in Table 8 compare *awp* cases for land and ocean. Land Box 1789 has NC<50 for both day and night and for DN as well. All averages are given and Acode=1. Ocean Box 1786 has NC=43 day and NC=13 night; thus because *min*=25, Acode=3 and because *vx*=25, AvgNt is set to Mcode. The Acode may have a value of "1" if *vx*<*min*, as for land in this example. For the ocean data here, *v*x=*min* so the Acode cannot be "1" (see Table 7 for clarification).

Example (h) also shows the use of bogus *awp* (Section 7 below) for Hi (46%) for Box 936 in Indonesia.

To give an idea of the extent of global coverage of these data, Table 9 also lists the number of boxes filled with minobs for the samples shown. For example, for total cloud over land in DJF (03_LMSA.41.tc), 811 of 820 B5c's had at least 100 obs both day and night (Acode=2). [The other nine boxes in this case had Acode=3 (not shown).] For *awp* (and base-height), the number of boxes filled will vary with cloud type because NC depends on the frequency of occurrence of the type. Thus there will be fewer boxes filled for awp_As than for awp_Ac and less for Cb than for Sc, for example.

6.3. File Categories 2, 12: Mean Annual Cloud Amount (LMAA, OMAA)

Files in Categories 2 and 12 (Format 121) give the annual average Dy, Nt, and DN amounts for all the cloud types, the frequencies of clear sky and precipitation, the sum of the low-level amounts, and the sum of the middle-level amounts (Table 5). Annual averages were computed by averaging the seasonal values from Categories 3 or 13 (amounts) and 4 or 14 (Cr & Pt frequencies). A seasonal value contributed to the annual average if there were at least a *min* of 100 obs for the season, except for ocean cloud types which required only 50 obs (Table 9). The NSN variable gives the number of seasons contributing to the average. The Acode assigned here for AvgDN was based on the Acodes of the seasonal averages contributing (Table 7). Acode was assigned as 2 if all seasons contributing to the annual average had Acode=2. If any contributing season had Acode=3, then Acode=3 also for the annual average. Acode=1 does not apply here. Acode=0 if no seasons had minobs. Table 9 shows that there were 817 (of 820) land boxes that had 4 seasons contributing to TC. For ocean TC, 1494 of the 1502 ocean boxes had averages computed, but only 1251 had 4 seasons contributing.

Example (k) in Table 8 shows the annual average total cloud amount for land Box 629 and the seasonal averages that contributed to it. In this example there are few nighttime obs in any season (16, 11, 21, and 15) so the Acodes are 3 for all seasons and for the annual average. The sum of all nighttime obs (63) is less than the min of 100 obs, so the annual AvgNt is missing. There is a variety of possible combinations of Acodes and NSNs for the annual averages.

6.4. File Category 11: Mean Seasonal and Annual Amounts, Land and Ocean Combined (LOCA)

Category 11 (Format 121) files are the only ones in which map groups are made up of land and ocean cloud averages merged. The longer period of record for the ocean data (1954-97) compared to the land data (1971-96) should not adversely affect this merger because most ship obs span the years 1965-90 (Figure 3a) and because trends, on both land (W07) and ocean (Norris 1999), are small compared to seasonal and diurnal variations. These map groups contain all 1820 grid boxes on the 5c grid (Table 5b). Many boxes will have either only land or only ocean data; averages for those boxes will come directly from the land or ocean map groups, respectively. In any grid box for which both land and ocean values contributed, an average was obtained by weighting the contributing land and ocean values by their respective fractional area within the box. There are 643 grid boxes that contain both land and ocean (Table 3 and Appendix C), but some of these have only land or only ocean data due to lack of ship obs or land stations. As was done for the seasonal and annual averages described in the previous two sections, a land or ocean value was allowed to contribute to a seasonal average if there was a minimum of 100 obs for the season (land and ocean considered separately), except for ocean cloud types which required only 50 obs. This is indicated in Table 9 where, for this file category, the *min* and *vx* variables were set to indicate the minobs used for land data and the minobs used for ocean data, respectively.

Because we give day averages and night averages, as well as DN averages, we had to make some choices when combining land and ocean values. Example (l) in Table 8, showing total cloud values for MAM for land (FC_03) and ocean (FC_13) and the resulting combination (FC_11), gives an example of one such choice. For the ocean box 1316 there were 1575 obs for daytime and 439 obs for night (resulting in Acode=2). For the land there were 1755 obs for daytime but only 3 obs for night (resulting in Acode=3). The nighttime land value has too few obs to be used. In dealing with such a situation, *we adopted the criterion of not mixing day and night between land and ocean.* In other words, we consider it to be undesirable to have a day average come from both land and ocean and the corresponding night average come from only ocean (or only land in some other case). Thus the choice was made to ignore the data with Acode=3 and use only the data with Acode=2, which, in this case, means that the values given for box 1316 in FC_11 came from the ocean data alone. *The Acode supplied in FC_11 has a different meaning* than for other categories (Table 7); here it indicates whether the values given came from *land (=1) or ocean (=2*, as in this example) *or both (=3)*. It happens that Box 1316 is an ocean box with a small island (see Example a) and the land average would contribute nothing to that combined average anyway because FRL=0.

Box 238 in this example [Example (l) in Table 8] shows the more straightforward case of a seasonal average made up of both land and ocean data. Because this box is mostly land (see Example a), the FC_11 averages are closer to the land value than to the ocean value. The Nobs listed in FC_11 is the sum of the Nobs for the land and ocean boxes contributing.

When constructing *annual* averages for land and ocean combined, other choices arise. Example (m) in Table 8 for total cloud illustrates this. In B5c 238 both land and ocean data are available for all 4 seasons, resulting in NSN=8 and Acode=3. Box 1316 is an example with only ocean data for all 4 seasons day and night. Box 26 shows the extreme case for which there were less than 100 ship obs day or night in any season but at least 100 ship obs day plus night in only one season. Box 502 illustrates an intermediate situation. Land data (FC_02) had minobs both day and night for all 4 seasons, but ocean data for the box (FC_12) had only one season satisfying minobs at night. The NSN variables in FC_11 show 8 seasons (sum of land plus ocean seasons) for day and DN, but only 5 for night. (By looking at FC_11 alone, one could not tell whether the 5 was made up from 4 land values and one ocean or from, say, 2 land and 3 ocean.) Any season with minobs, day or night, was allowed to contribute. Annual averages for Dy, Nt, or DN were obtained independently of each other by averaging values contributing to Dy, Nt, or DN, respectively. Consequently, the AvgDN in FC_11 for box 502 does not exactly equal (AvgDy + AvgNt)/2, and similarly for AvgDN in FC_12, whereas the two averages are the same for Box 238. This choice allows the most land and ocean seasonal averages to contribute, but a user of this dataset is free to start with the seasonal averages and use some other method to compute annual averages. **Figure 4** is a map of the annual total cloud cover over land and ocean combined (from our website www.atmos.washington.edu/CloudMap). Of the 1820 B5c's, 1783 had at least 100 obs from land stations and/or ships (Table 9; most of the 37 empty boxes are for land areas with no weather stations).

6.5. File Categories 6, 16: Mean Seasonal Non-overlapped Amount for Upper Clouds (LMSU, OMSU, O10U)

Categories 6 and 16 (Format 121) contain the mean seasonal averages of the non-overlapped amount (Section 4.4.2) for the four middle and high cloud types (Ns, As, Ac, Hi). The *min* used in computing AvgDN and Acode for the land data was 100, but averages are given for any number of obs (*vx*=1, Table 9); 50 obs were required with the ocean data to give any average (*min*=*vx*=50).

Example (n) in Table 8 shows NOL for the four upper types for MAM for two land boxes. B5c 574 (China) has small NOL values (9% for Ac, and <3% for each of Ns, As, Hi) from more than 150,000 obs, while Box 1777 (Antarctica) has much larger non-overlapped amounts averaged from less than 400 obs, mostly daytime (7% for Ns, 12% for Ac, 15% for As, 15% for Hi; Acode=3). Inspection of File 03_LMSA.42.mll (not shown) shows that Box 574 is in a region with a large amount of low clouds (62%), while low clouds in Box 1777 amount to only 2%. The small amount of low clouds in Box 1777 allows more of the upper-level clouds to be visible, accounting for higher NOL values. Ocean values for NOL_Hi in B5c 574 [MGRP 16008 also shown in Example (n)] are similar to the land values in the same box (MGRP 06008).

NOL data for the ocean are also given on the 10r grid in FC_16; the file abbreviation "O10U" is used for these data to distinguish them from the 5c map groups in the category.

(The "U" in these file names was selected as a single-character representation for NOL. It could be thought of as signifying "un-overlapped".)

6.6. File Categories 7, 17: Mean Seasonal Base Height for Low Clouds (LMSH, OMSH, O10H)

Categories 7 and 17 (Format 122) contain the base heights for the four low cloud types (St, Sc, Cu, Cb; height for fog is, by definition, zero). Format 122 differs from Format 121 only in that *avg* for base height is given to whole meters (F6.0, Table 6b). AvgDN for base height was computed from all available obs as explained in Section 4.4.2. For land, a min of 50 was used to determine the Acode, though averages are given for any number of obs (*min*=50, *vx*=1; Table 9). For ocean, a min of 25 was used for determining the Acode and for listing an *avg* (Mcode was entered if NC < 25). The number of boxes filled with minobs varied with the cloud type because NC depends on the frequency of occurrence of the type. [Nobs for height (NC) may be less than the number of occurrences of the cloud type (NTy) since *h* (Table 1) is not always reported.]

Example (o) in Table 8 lists data records for two boxes from the land file for low-cloud base heights for MAM. The average height of St in Box 792 in the Philippines is 486m, computed from only 71 obs. Cumulus is far more common in this box, with 16,113 obs, and its average height is 556m. Box 36 (in Russia), by contrast, has a height of 287m for St from 4791 obs and a height of 966m for Cu from 132 obs. Ship obs from the ocean portion of Box 792 [FC_17 in Example (o)] show base heights of 360m for St and 531m for Cu. Base heights tend to be higher over land than over water (Table 10).

Base heights for ocean clouds are given also on the 10r grid in FC_17, using the file abbreviation "O10H" to distinguish them from the 5c map groups in the category.

6.7. File Categories 8-9, 18-19: Mean Monthly Cloud Amount and Frequency (LMMA, LMMF, OMCA, OMCF)

Categories 8-9 and 18-19 (Format 121) contain the multi-year *monthly* averages for cloud amount and frequency. For land the grid-box size is 5c as always; the minobs used in the computation of AvgDN was 75 (with *vx*=1; Table 9). For land, fog is included in both FC_8 and FC_9 (this is redundant information, since fq_Fo = amt_Fo); thus there are 11 types given in FC_9 compared to 10 in FC_19 for the ocean, where fog is not redundantly included (Table 5a). The grid size used for the ocean data is 10r (Table 3) because the number of ship obs becomes more limiting for a month than for a season. Precipitation frequencies were computed using *min*=75 and *vx*=1 for both land and ocean averages (Table 9), while for the ocean *min* and *vx* are 100 and 25 for both TC and Cr, but 50 and 50 for cloud types.

Following the averages for the 12 months in FCs 18 and 19, and numbered consecutively, are the *seasonal averages on the 10r grid* (seasonal averages on the 5c grid are given in FCs 13 and 14).

[Note that in the Arctic Ocean, when converting precipitation averages from the 5c to the 10r grid (see Section 4.4.1), there is an incompatibility in the 80-90°N zone. The nine 5c boxes in the 80-85°N zone (Table 3) map into the three 10r boxes covering 80-90°N, but B5c 1 (85-90°N) does not. Here we chose to omit the data of B5c 1 from B10r's 1-3 rather than put them into a wrong box. Data from B5c 1 make up about 25% of the obs in the 80-90°N zone. The seasonal precipitation frequencies for B5c 1 are contained in FC_14, so they could be added to the seasonal values in FC_19 at the user's discretion. This situation does not arise at 80-90°S because that zone is 100% land. It is also not an issue with other data in this archive because data for three divisions of B5c 1 were carried for this purpose during the present analysis. This remark therefore applies only to precipitation frequencies, and only in the North Polar region.]

There are usually four 5c boxes in a 10r box. Example (p) in Table 8 lists Ac amount for MAM for B10r 67 (North Pacific) from FC_18, as well as the four associated 5c boxes from FC_13 for comparison.

The monthly averages in these files were used in computing the annual cycles in FCs 10 and 24.

6.8. File Categories 20-23: Multi-year Seasonal Averages by Synoptic Hour (Ocean) (OSAT, OSFT, OSUT, OSHT)

Categories 20-23 (Formats 138 and 139) give averages of cloud variables (seasonally) for the eight synoptic hours for ocean cloud data on the 10r grid. [The 8 synoptic hours are 00, 03, 06, 09, 12, 15, 18, 21 GMT. The "T" in the file names was chosen to signify "Time-period".] Land values were given in the companion archive (NDP-026D, H03) for individual stations. Formats 138 and 139 contain fewer variables than Formats 121 and 122 used above, but eight data lines (one for each hour) are given for each box (Table 6b). The minima required to include an average in the archive are shown in the header records listed in Table 9 and range from 1 to 50. The *vx* variable was not included in the header record in these files but in all cases it is the same as the min.

Example (q) in Table 8 lists the data records for two boxes for the frequency of clear sky in JJA. B10r 72 (eastern Pacific coast) has at least 500 obs for all 8 hours, but 90% of the reports were made at the 6-hourly times 00, 06, 12, 18. The local times (LT) corresponding to the synoptic hours for the center of this box are listed under the comments column in the example. (GMT can be converted to LT by using the box-center longitude given in File Category 1.) The hours LT are labeled as day (dy) or night (nt). Summing the obs over the day and night hours shows that 73% of the reports are for the daytime hours. Inspection of the values shows that clear sky is most common near midnight and least common about 7 AM. This example also shows the effect of the application of the illuminance criterion (Section 3; H95) on the number of obs. The hour closest to midnight will have the fewest usable obs; in this example that hour, of the 6-hourly times, is 06 GMT which has 5842 obs compared to 34,676 at 18 GMT.

B10r 166, which includes part of the Bay of Bengal and Andaman Sea, has much less frequent clear sky (about 1%) than box 72 (about 8%). Its diurnal cycle is thus small in absolute terms though large in relative terms (fq_Cr is nearly 5 times greater at 00 LT than at 18 LT). Only the 6-hourly times have sufficient obs from which to compute a diurnal cycle. GMT hours 15 and 21 had fewer obs than the min of 25, so we set Nobs to zero and blanked the *avg* variable (set it to Mcode).

These files were used to compute the diurnal cycles of ocean clouds given in FC_24.

6.9. File Categories 10, 24: Annual and Diurnal Cycles (LHRM, OHRM)

Categories 10 and 24 (Formats 140, 148, 149) give the phase (PHASE), amplitude (AMP), and variance accounted for (VAF) of the first harmonic of the annual cycle or diurnal cycle for cloud amount, frequency, and base height. PHASE is the time of maximum of the fitted cosine curve. Formats 140, 148, and 149 differ only in that the label "140" is used to signify that the values of PHASE and NT (Table 7) are representative of months whereas the label "148" (and 149 for height) is used to signify that PHASE and NT are representative of hours of the day. AVG is the average of the 12 monthly values, or the 4 or 8 hourly values. The annual averages may differ slightly from the annual averages given in FC_2 and FC_12 because of the different methods of averaging (Section 6.3). Similarly, the seasonal averages may differ from those given in FCs 17, 18, and 19 (Sections 6.6 and 6.7). The redundancy of producing computations for fq_Fo with the land data was not repeated with the ocean data (Table 5).

An *annual cycle* was computed for each box from the monthly averages in FCs 8-9 and 18-19. The DN averages were used if all 12 months had Acode=2 (i.e., if the min was satisfied both day and night). If that test failed, the Dy averages were used if the number of daytime obs in each month was at least *vx* (the value of *vx* is given in Table 9). If DN values were used to compute the annual cycle, NT was set to 12; if daytime averages were used it was set to -12. Mcode was inserted for the variables if the number of months (NT) was less than 12. Table 9 (Num_Boxes_Filled) indicates that, for land TC, 791 5c boxes had annual cycles computed from DN averages and 21 boxes from Dy averages. For the ocean, 296 10r boxes had annual cycles computed from DN averages and 33 boxes from Dy averages.

Example (r) in Table 8 shows the annual harmonic parameters for TC for three land boxes and three ocean boxes. The three land boxes are located in the USA (around Seattle, Denver and Tucson, respectively) and have distinctly different climates from each other. Tucson, with the lowest annual cloud amount (29.5%) of the three, shows a maximum (AMP=4.42% absolute cloud cover) in early January (PHASE=0.89), but the variance accounted for (VAF) is small (19.4%), because the second harmonic (semi-annual cycle) is large there. Denver, with an annual cloud amount of 49.8%, shows a more significant first harmonic (AMP=5.34%, VAF=68.3%) with the maximum in late March (PHASE=3.36). Seattle has the greatest cloud cover (68.3%) and the largest annual variation (AMP=12.00%, VAF= 71.2%) with its maximum in early February (PHASE=1.61). The ocean box B10r 72, which includes B5c 238 (the coastal box containing Seattle), has a comparable though slightly larger cloud amount (71.8%) and a phase also in February (PHASE=2.01), though a smaller amplitude (5.06%) than the land part of this box. The data record for B10r 90 in the ocean examples shows NT = -12, the minus-sign indicating that daytime averages were used to compute these annual harmonic parameters. The example of Box 131 shows a case in which only 2 months had minobs, so the parameters were set to Mcode.

Diurnal cycles for ocean clouds were computed from the 3-hourly averages given in FCs 20, 21, 23. Since land averages by synoptic hour are archived by station but not by box (see Section 6.8), we used the station data in NDP-026D to compute land averages by box; we then used them to compute the diurnal cycles presented here. We did not compute diurnal cycles for NOL, though we do provide the hourly averages in FC_22 for the ocean and in NDP-026D for land stations. Diurnal cycles for base-height are provided only for the ocean data; for land the user can compute them from hourly values in NDP-026D.

The diurnal-cycle parameters for a land box are given (in File Category 10) if each of the 8 hours had at least 75 obs or if each of the four 6-hourly times (0, 6, 12, 18 GMT) had at least 75 obs. A box with 8 hours passing this test was then tested for the ratio N6/N3, where N6 is the total number of obs at the 6-hourly times and N3 is the total number of obs at the intermediate 3-hourly times. If this ratio exceeded 4.0 (*vx* in Table 9) then the diurnal cycle was computed from only the four 6-hourly averages. This was done to reduce a possible bias which may result if reports are made at the intermediate 3-hourly times only in special weather conditions. The numbers under the "Num_Boxes_Filled" column in Table 9 for FC_10 indicate that, for TC in DJF, diurnal-cycle parameters were computed from all 8 hours for 544 5c land boxes, and they were computed from the four 6-hourly times for 201 boxes (it turns out that 42 of these were for cases with N6/N3 > 4).

The calculation of diurnal parameters for ocean boxes is similar to that just described for land but with two variations. First, the cutoff used for the ratio N6/N3 was 6 rather than 4 (as indicated with the *vx* variable in the header record as shown in Table 9 for FC_24). Second, that criterion was overridden if each of the intermediate 3-hourly times had at least 150 obs (twice the min of 75). This somewhat arbitrary option was added to try to improve the resolution of the diurnal cycles over the ocean. Table 9 for FC_24 indicates that, for TC in DJF, the diurnal harmonic was computed from 8 hours of data for only 142 10r boxes, and from 4 hours of data for 223 boxes. We pointed out in Section 2 that 88% of the ship reports are for the 6-hourly times. Thus for most boxes the diurnal cycles will be determined from only 4 hours. Also, ship reports are susceptible to such biases as the foul-weather bias (W88) which may affect the intermediate 3-hourlies. A user of this archive is free to recalculate diurnal cycles (from the synoptic-hour averages) using different criteria.

Example (s) in Table 8 gives the diurnal parameters for stratocumulus amount in JJA for two land boxes (B5c) and three ocean boxes (B10r). B5c 238, which includes Seattle and the Washington coast, had an N6/N3 ratio of 19 (Nobs not shown) so the diurnal parameters were computed from the 6-hourly times (NT=4). The average Sc amount is 21.8%; the amplitude of the first harmonic of the diurnal cycle is 5.5%, with a phase (maximum) after 4 AM local time. The VAF of 72% indicates that the first harmonic represents the diurnal cycle fairly well. The ocean box that spans the area of B5c 238 is B10r 72. The example shows that the ocean box has more Sc cloud (31.5%), a somewhat smaller amplitude (3.34%), and a similar phase (before 5 AM). Although N6/N3 was 8.5 for the ocean box, all hours had more than 150 obs, so NT=8 (note Nobs for fq_Cr in Example q).

The land box B5c 1184, along the coast of Peru, has a large diurnal cycle in Sc amount in JJA (AMP=15.82, avg=36.6) and was determined using all 8 synoptic hours. Similar to the case with the land and ocean boxes around Seattle, the ocean box (B10r 293) for this region has a larger average, smaller amplitude, and similar phase. For the ocean box B10r 103, the computed diurnal parameters can be related to the Sc amounts for the 8 hours shown earlier in Example (q). The ratio N6/N3 is 18, and Nobs for the hour 15 GMT is only 135 (less than 150), so only the four 6-hourly averages are used in this case. While the average of the 6-hourly amounts is 24.2%, the average of the intermediate 3-hourly amounts is 29.7. This is an example of a "zigzag" situation discussed in W88.

6.10. File Categories 25-40: Seasonal Averages by Year (Ocean) (OSMA, OSMF, OSMU, OSMH)

Categories 25-40 (Formats 226 and 227) provide Dy, Nt and DN averages of the cloud variables for the individual years (1952-97) of each season for ocean cloud data on the 10r grid. Land values were given in the companion archive (NDP-026D, H03) for individual stations. The data record for a grid box contains 46 lines, one for each year, listed in ascending order by year. [Although we provide averages beginning with 1952, we do not recommend using the ocean data prior to 1954 (Section 2)]. The minobs required to include an average in the archive, shown in selected header records listed in Table 9, was 20 for base height and 25 for everything else. The header record in these files does not list *vx*, but in all these files *vx=min*.

Example (t) in Table 8 lists the cumulus amounts by year for MAM in B10r 278 (northern Australia coast). This example demonstrates a variety of averaging methods. (To save space, data lines for several years with similar information content have been omitted.) Use of *min*=25 gave 23 years with Acode=2 for AvgDN, such as in 1980 for which AvgDN = 18.87% = (20.60 + 17.14)/2. In 1971 there were 78 obs, 60 of which were for daytime; AvgDN (13.46) was computed as the mean of 60 daytime obs and 18 nighttime obs, so Acode=3; Mcode appears for AvgNt because it had fewer than 25 obs. In 1959 there were fewer than 25 obs total, so all averages were assigned the Mcode, and Acode=0. Users will probably want to set a min greater than 25 for trend analyses. Trends computed for this box will be less reliable than for the many boxes that have hundreds or thousands of obs per year. For TC in DJF (Table 9) there are 279 B10r's that have *min*=25 both day and night for at least 20 years, and 330 boxes that have *min*=25 for daytime for at least 20 years. As a reminder, the ancillary files described in Section 6.1.1 give, for each season, the number of years for which there were at least the specified minobs for each box.

6.11. File Categories 41-52: Monthly Daytime Averages by Year (Ocean; OMYD)

Categories 41-52 (Format 162) give monthly averages for individual years (1954-97) for TC, Cr, and the nine cloud types. [Land values were given in the companion archive (NDP-026D, H03) for individual stations.] Because the illuminance criterion typically causes us to reject nighttime data from two contiguous weeks out of each month, nighttime averages for a single month cannot be fully representative of that month. For individual months we therefore give only daytime averages. It is then convenient to include the three cloud variables of Eq. 1 (*amt, fq, awp*) in a single data record (Format 162). The data for a grid box consists of 44 lines, one for each year. The data record for a single year includes Nobs, *amt, fq, awp,* and NC. Here NC is the number of occurrences of a cloud type for which *awp* was computable. The mins used for reporting the averages are indicated in Table 9. To allow for user flexibility, no min is applied in presenting TC or Cr (*min*=1); however a min of 20 was required to give frequency and amount for cloud types, and a min of 15 (indicated as *vx*=15 in these files) was applied to NC for reporting *awp*. For TC or Cr, NC is not applicable, so *vx* in their header records is assigned the value –9, and *fq* and *awp* are set equal to Mcode in the data records.

For TC in January (Table 9) there are 283 B10r's that have a min of 20 obs daytime for at least 20 years; for Hi in December, 226 boxes have *min*=20 for daytime for at least 20 years. As a reminder, the ancillary files described in Section 6.1.1 give, for each month, the number of years for which there were at least the specified minobs for each box.

Example (u) in Table 8 shows 44 years of daytime amounts of high cloud for ocean B10r 31 for April. In most years this box has more obs than any other box, and it displays several characteristics of the application of the minima, *min* and *vx*. For most years there are more than 1000 obs (filling all 4 spaces allotted to Nobs in the I4 format), yet in 1956 there are less than 20 obs. In 1955 the 39 obs are sufficient for computing *fq*, but there are less than 15 obs for computing *awp* (*awp* was set to Mcode; NC was set to zero). Still, *amt* is given because *mina* (= 0.4206 × 15 × 0.6 = 3; Section 4.4.2) is less than the actual NC (not shown). In 1957 there are 33 obs, again sufficient for computing *fq*, but in this case the actual NC is less than *mina* (= 0.3342 × 15 × 0.6 = 3). Thus *amt*, as well as *awp*, is assigned the Mcode. The user must check for the Mcode, and not only Nobs, when selecting which values of *amt* to use.

7. IMPORTANT NOTES ON THE USE OF THIS DATASET

7.1. Minimum Numbers of Observations, the Missing-Value Code, and the Acode

In many cases, particularly for land data, we did not require a minimum number of observations to report averages for the day or night average or for the averages for individual synoptic hours (*vx*=1 in Table 9). This "hands-off" treatment allows the user to aggregate the data in any manner. However, this also *requires the user to check* Nobs against a user-specified minimum, and to check an *amt* for Mcode before using the data. [The amount of a middle or high cloud type may be "missing" even when Nobs>0 if *awp* is unavailable, as discussed in Section 6.2 and exemplified in Example (f) of Table 8.] For most ocean cloud averages, however, *vx* was usually set equal to *min*; thus *min* was used not only to determine the Acode for the DN averages, but also as a criterion for the Nobs required to give an average for day or night or for a synoptic hour. This treatment reduced the complications associated with use of the ocean data, which had fewer obs than land and which also required a number of adjustments to cloud-type averages (Section 4.4.3). The Acode is a convenient guide for screening DN averages if one accepts the mins we applied to the various data files in this archive.

7.2. Land Stations with Bogus Amount-When-Present

China. Because of an inconsistency in the reporting procedures in use in China in the 1970's (reporting Nh=0 when CL=0 with CM>0; described in detail in W86 and H99), the middle-cloud data records for all 585 Chinese stations used for the years 1971-79 were assigned an *awp* obtained from observations in 1980-89, averaged and applied for each of the 12 months separately (H03). These station data, for all the years, were combined into their respective 5c grid boxes for the present climatology. Fifty boxes are affected; they are indicated on the map in **Appendix D**. This adjustment is less important for the long-term averages given here (because of the longer span of years) than it was for our old climatology (W86) or for assessing trends in middle-cloud amount (W07).

Indonesia and South America. During preliminary analyses of land-station data, we discovered that there were two equatorial regions in which the ratio NC/NTy for upper cloud types (the number of times the cloud amount was computable, divided by the number of times the cloud was present) was quite small (<0.25, compared to 0.7 globally). Our analysis suggested that the average *awp*'s obtained from the resulting small sample were unrepresentative. We therefore chose to apply appropriate mean values of *awp* to the stations in the affected region. Global, mean annual values for DN averages of *awp* were obtained in a preliminary analysis and then applied to these selected boxes for all seasons and times: 98% for Ns, 80% for As, 51% for Ac, and 46% for Hi. We did this for the land stations in these boxes, but not for the ocean analyses, because the ocean *awp*'s did not appear noisy or unrepresentative.

The stations affected lie in 47 B5c's in an irregular region between latitudes 10°N and 10°S and between longitudes 95°E and 175°E (including Indonesia and other islands) and in just two South American boxes (0-10°N, 55-60°W). Station IDs for the 155 stations affected were listed in H03. The 47 boxes affected are included in the map in **Appendix D**. These "bogus" values of *awp* appear in the Dy, Nt and DN averages in FC_05 for these boxes, as is seen for high cloud in Box 936 in Example (h) of Table 8. Diurnal or interannual variations of middle or high cloud amounts that we report for these boxes are therefore due solely to variations of frequency.

7.3. Ships on Land

Occasionally the latitude or longitude in the weather report from a ship is recorded or transmitted or interpreted incorrectly. This was discussed in W88. When preparing the EECRA (H99), the archive of surface synoptic cloud reports used in the present analysis, we rejected ship reports from the COADS archive whose latitude and longitude placed the ship inside a 5c grid box whose land fraction was 100% (except for large lakes as described in Section 6.1). This resulted in the rejection of 0.1% of the reports, but we have to expect that twice this number remained scattered and undetected in ocean boxes around the globe. During the present analysis, we happened to notice that some temperatures associated with cloud reports in the Arctic Ocean were unreasonably high (an EECR contains temperature, pressure, wind, and humidity variables as well as clouds). For the present analysis we rejected those reports. We subsequently checked ship latitude and longitude against the land fraction in smaller grid boxes (2.5-degree; available in NDP-026A, H94) and found that many of those polar reports with high temperatures were from ships reporting a land location and therefore were clearly mislocated. Mislocated reports will bias the grid-box averages slightly toward the global averages. They have little effect in well-sampled regions.

7.4. Bad Land-Station Data

After completion of the cloud climatology archive for land stations (NDP-026D, H03) and during our trend analyses (W07), we discovered several stations whose cloud averages appeared to be erroneous or biased. The largest set of such stations was a string of military stations along latitude 69°N across Canada and Alaska, the Distant Early Warning (DEW) Line. For many of these stations we found suspiciously large positive trends in nimbostratus amount. Examination of this peculiarity showed that the problem involved the reporting of the present-weather code ww (Tables 1 & 2) and another aspect of the 1982 code change mentioned in Section 4.4.3. Another seemingly minor rule change at that time was that observers were not required to report ww if "observed phenomena were not of significance". To distinguish between this situation and one in which ww was "not available", a "present weather indicator" flag (Ix) was to be set. Values of $Ix > 3$ signified automatic weather stations, which we discard. The value $Ix = 1$ indicated that ww was given in the weather report; $Ix=2$ indicated that ww was "not of significance". Such reports could be used for cloud analyses. The value $Ix = 3$ signified "data not available" at a manned station. We must reject such reports because knowledge of ww is essential for our interpretation of cases of $N=9$ and Ns (Table 2). Apparently after a reduction in staffing in 1985-6, many of the DEWline stations began inappropriately reporting $Ix=3$ in situations where they should have set $Ix=2$. Thus our procedures caused us to reject reports from these stations after this time unless ww indicated precipitation or fog ($Ix=1$); this caused nimbostratus to become over-represented in the later years. Consequently, computed trends for these stations were spurious, and long-term averages given in the archive are too high. We plan to remove the cloud averages for those stations for the years beginning 1986, but have not done so as of this writing. The stations affected by this, and the B5c's containing them, are listed in **Appendix E1**. The appendix also lists a few other stations that gave results that were strange in some way.

7.5. Bad Ship Data

In the documentation to the EECRA (H99) we listed 28 B5c's that should not be used for cloud-type analyses because of a large "bias fraction" in the reporting of cloud types (Section 4.4.3). The locations of these boxes, typically in large lakes and semi-enclosed seas, are shown as negative values on the map in Appendix C. They are also listed in **Appendix E2** along with a listing of several other boxes for which we found anomalous values for various cloud variables. In some cases we have eliminated the bad data from the archive, while in other cases we have manually blanked the boxes on maps on our website if the bad data are still in the archive. Not listed in the appendix are B10r's south of 60°S whose diurnal cycles of cloud types are bad for MAM and SON due to inadequate sampling. A min of only 75 obs per time period was required for computing the diurnal cycles given here (Section 6.9). There are probably other questionable values throughout the data, and this serves as a note to users about the kinds of problems that may still lurk in the cloud data.

7.6. Land Station Duplicates and Changes to Station Identifiers

In H99 we noted a change of the 5-digit WMO station identifiers (ID's) in 1977 for some Canadian stations. These station data were reconciled during production of our land-station climatology (H03). A user of our database subsequently found that a similar change had occurred for some stations in Antarctica, and also that some stations in Taiwan had two ID numbers at the same location (Joel Norris, personal communication, 2005). The Antarctic station at Fossil Bluff gave weather reports under the station ID 88962 until 1986, when it began reporting under 89065. Similarly, the station at Dumont d'Urville reported under 95502 until 1986 when it switched to 89642. With this knowledge, data from each of these two pairs of station ID's can be merged for analysis of trends. Of course both pairs contribute to the long-term averages in their respective grid boxes in the present climatology.

Several locations in Taiwan have stations ID's that begin with both 46 and 58 or 59. For example, 46492 and 58968 (Taipei) give similar, though not always identical, reports. At Hengchun, 46759 and 59559 have similar but not quite identical periods of record (see FC_01 in H03). Other pairs discovered are: 46495 & 58974, 46749 & 59159, 46763 & 59362, 46741 & 59358, 46766 & 59562, and 46762 & 59567. This appears to be a political issue that is beyond the scope of the present documentation. The climatologies are similar.

7.7. A Note on Ship Weather Reports in the EECRA

The reports in our cloud-report archive, the EECRA (NDP-026C, H99), contain the basic weather variables in addition to cloud information. The documentation for that dataset noted that, for the ship data, extreme values which were labeled as "trimmed" from the COADS summary data (Slutz et al., 1985) were blanked (assigned the Mcode) in an EECR. This trimming was often too restrictive, so some valid high or low values of temperatures or winds may have been blanked.

8. HOW TO OBTAIN THE DATA

This documentation and the data described herein are available from:

Carbon Dioxide Information Analysis Center (CDIAC)
Oak Ridge National Laboratory
Post Office Box 2008
Oak Ridge, TN 37831-6335, U.S.A.
(http://cdiac.ornl.gov/epubs/ndp/ndp026e/ndp026e.html)

The following citation should be used for referencing this archive and/or this documentation report:

Hahn, C.J., and S.G. Warren, 2007: *A Gridded Climatology of Clouds over Land (1971-96) and Ocean (1954-97) from Surface Observations Worldwide*. NDP-026E, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, TN.

Maps and some digital data can be viewed on the website:
http://www.atmos.washington.edu/CloudMap/.

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The associated website was developed by Ignatius Rigor. Ryan Eastman performed trend analyses and helped track down irregularities in the data. Joel Norris gave valuable suggestions.

REFERENCES

(H88) Hahn, C.J., S.G. Warren, J. London, and R.L. Jenne, 1988: *Climatological Data for Clouds Over the Globe from Surface Observations.* NDP-026, Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory, Oak Ridge, TN. [Also available from Data Support Section, National Center for Atmospheric Research (NCAR), Boulder, CO.]

(H94) Hahn, C.J., S.G. Warren, and J. London, 1994: *Cloud climatology for clouds over the globe from surface observations, 1982-1991: The total cloud edition.* Numeric Data Package NDP-026A, Carbon Dioxide Information Analysis Center, Department of Energy, Oak Ridge, TN.

(H95) Hahn, C.J., S.G. Warren, and J. London, 1995: The effect of moonlight on observation of cloud cover at night, and application to cloud climatology. *J. Climate*, **8**, 1429-1446.

(H96) Hahn, C.J., S.G. Warren, and J. London, 1996: *Edited Synoptic Cloud Reports from Ships and Land Stations over the Globe, 1982-1991*. NDP-026B, Carbon Dioxide Information Analysis Center, MS-050, Oak Ridge National Laboratory, Oak Ridge, TN (Documentation 47 pages).

(H99) Hahn, C.J., and S.G. Warren, 1999: *Extended Edited Synoptic Cloud Reports from Ships and Land Stations Over the Globe, 1952-1996*. NDP-026C, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, TN (Documentation 71 pages) http://cdiac.ornl.gov/epubs/ndp/ndp026c/ndp026c.html (Includes 2002 update extending ship data to 1997.)

(H03) Hahn, C.J., and S.G. Warren, 2003: *Cloud Climatology for Land Stations Worldwide, 1971-96*. NDP-026D, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, TN (Documentation 35 pp.). http://cdiac.ornl.gov/epubs/ndp/ndp026d/ndp026d.html

Norris, J.R., 1998: Low cloud type over the ocean from surface observations, Part II: Geographical and seasonal variations. *J. Climate,* **11**, 383-403.

Norris, J.R., 1999: On trends and possible artifacts in global ocean cloud cover between 1952 and 1995. *J. Climate*, **12**, 1864-1970.

Slutz, R.J., S.J. Lubker, J.D. Hiscox, S.D. Woodruff, R.L. Jenne, D.H. Joseph, P.M. Steurer and J.D. Elms, 1985: *Comprehensive Ocean-Atmosphere Data Set, Release 1*. NOAA Environmental Research Laboratories, Boulder, CO., 268 pp. (NTIS PB86-105723).

(W85) Warren, S.G., C.J. Hahn, and J. London, 1985: Simultaneous occurrence of different cloud types. *J. Clim. Appl. Meteor*. **24**(7), 658-667.

(W86) Warren, S.G., C.J. Hahn, J. London, R.M. Chervin, and R.L. Jenne, 1986: *Global Distribution of Total Cloud Cover and Cloud Type Amounts over Land*. NCAR Technical Note TN-273+STR, Boulder, CO, 29 pp. + 200 maps (also DOE/ER/60085-H1). Available from Carbon Dioxide Information Analysis Center, Oak Ridge, TN.

(W88) Warren, S.G., C.J. Hahn, J. London, R.M. Chervin, and R.L. Jenne, 1988: *Global Distribution of Total Cloud Cover and Cloud Type Amounts over the Ocean*. NCAR Technical Note TN-317+STR, Boulder, CO, 42 pp. + 170 maps (also DOE/ER/0406). Available from Carbon Dioxide Information Analysis Center, Oak Ridge, TN.

(W91) Warren, S.G., C.J. Hahn, and J. London, 1991. Cloud hole over the United States? *Bull. Amer. Meteor. Soc.,* **72***,* 237-238.

(W07) Warren, S.G., R.M. Eastman, and C.J. Hahn, 2007: A survey of changes in cloud cover and cloud types over land from surface observations, 1971-96. *J.Climate*, **20**, 717-738.

Woodruff, S.D., R.J. Slutz, R.L. Jenne, and P.M. Steurer, 1987: A comprehensive ocean-atmosphere data set. *Bull. Amer. Meteor. Soc.*, **68**, 1239-1250.

World Meteorological Organization (WMO), 1988: *Manual on Codes, Volume 1.* (WMO Publ. No. 306), WMO, Geneva.

Worley, S.J., S.D. Woodruff, R.W. Reynolds, S.J. Lubker, and N. Lott, 2005: ICOADS Release 2.1 data and products. *Int. J. Climatol.*, **25**, 823-842. (see http://icoads.noaa.gov/)

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Tables and Figures Follow

TABLE 1. CLOUD INFORMATION CONTAINED IN SYNOPTIC WEATHER REPORTS^

Symbol	Meaning	Codes#
N	total cloud cover	0-8 oktas 9= sky obscured
Nh	amount of lower cloud*	0-8 oktas
h	base height of lower cloud*	0-9
CL	low cloud type	0-9
CM	middle cloud type	0-9
CH	high cloud type	0-9
ww	present weather	00-99
Ix	present weather indicator	1-6

^ Reports are made 8 times per day: 00, 03, 06, 09, 12, 15, 18, 21 GMT.
# Oktas are eighths of sky cover, with "0" meaning completely clear sky and "8" meaning completely overcast sky.
Any category for which information is lacking is coded as "/".
* The "lower" cloud is the middle level if there are no low clouds.

TABLE 2. CLOUD TYPE AND WEATHER TYPE DEFINITIONS USED

Level	Shorthand notation	Meaning	Synoptic codes	Extended codes#
	TC	total cloud cover	N = 0-9	0-8
	Cr	completely clear sky	N = 0	
	Pt	precipitation	ww= 50-75,77,79,80-99	
	D	drizzle	50-59	
	R	rain	60-69	
	S	snow	70-75,77,79	
	Ts	thunderstorm or shower	80-99	
Low			CL=	
	Fo	sky obscured by fog	/ with N=9 and ww=10-12,40-49	11
	St	stratus	6,7	
	Sc	stratocumulus	4,5,8	
	Cu	cumulus	1,2	
	Cb	cumulonimbus	3,9, or N=9 with ww=Ts	10
	LoL	Fo + St + Sc + Cu + Cb		
Mid			CM=	
	Ns	nimbostratus	2,7, or N=9 with ww=DRS	12,11,10
			/ with ww=DRS and CL=0,7	10
			/ with ww= RS and CL=4-8	10
	As	altostratus	1; 2 if not DRS	
	Ac	altocumulus	3,4,5,6,8,9; 7 if not DRS	
	MiL	Ns + As + Ac		
High			CH=	
	Hi	cirriform clouds	1-9	

Used in the source dataset, the EECRA (NDP-026C). Extended codes are shown where they differ from synoptic codes. In the extended code the value "-1", rather than "/", is used to signify missing information.

TABLE 3. GRID BOX SIZES USED

Box Size (shorthand)	Dimensions lat x lon degrees	Latitude range	Number of Boxes in		Number of Boxes with		
			zone	globe	Land	Ocean	Land and Ocean
5x5c				1820	961	1502	643
(5c)	5 x 5	50N to 50S	72				
	5 x 10	50 to 70	36				
	5 x 20	70 to 80	18				
	5 x 40	80 to 85	9				
	5 x 360	85 to 90	1				
10x10r				456	310	404	258
(10r)	10 x 10	50N to 50S	36				
	10 x 20	50 to 70	18				
	10 x 40	70 to 80	9				
	10 x 120	80 to 90	3				

TABLE 4a. DATA FILE INFORMATION for Gridded *LAND* Cloud Archive, *1971-1996*

File Cat.	Category abbrev.	General contents@ [for 820 5c Land Boxes]	Num of Types*	Logical records	Char per data_rec	fmt num	Mega-Bytes
_	RDME	README (brief introduction)		198	80	80	0.01
1	BLLF	GRID LAT, LON, LAND-FRACTION & Number of land stations	2	2,278	30	115	0.07
		MULTI-YEAR AVERAGES					
2	LMAA	Mean Annual Cloud AMOUNT	14	11,494	46	121	0.53
3	LMSA	Mean Seasonal Cloud AMOUNT	12*l*	39,408	46	121	1.81
4	LMSF	Mean Seasonal Cloud FREQUENCY	11*p*	36,124	46	121	1.66
5	LMSW	Mean Seasonal AMOUNT-WHEN-PRESENT	8*w*	26,272	46	121	1.21
6	LMSU	Mean Seasonal Mid, Hi Cloud NON-OVERLAPPED AMOUNT	4*u*	13,136	46	121	0.60
7	LMSH	Mean Seasonal Low Cloud BASE HEIGHT	4*h*	13,136	46	122	0.60
8	LMMA	Mean Monthly Cloud AMOUNT	10*a*	98,520	46	121	4.53
9	LMMF	Mean Monthly Cloud FREQUENCY	11*p*	108,372	46	121	4.99
10	LHRM	Harmonics: ANNUAL, DIURNAL	12	86,205	26	140	2.24
1-10							18.25

@ Data formats (fmt num) are given in Table 6. Abbreviations used are defined in Glossary (Table 7). Mean seasonal (or long-term) averages span 1971-96 for land and 1954-97 for ocean.

* Not all types are given in every file. The code applied is:

Number of types code	Meaning	Uses
14	TC Cr Pt Fo St Sc Cu Cb Ns As Ac Hi MiL LoL	Amt,Fq: FC's 2,11,12.
12*l*	TC Fo St Sc Cu Cb Ns As Ac Hi MiL LoL	Amt: FC's 3,13.
12	TC Cr Pt Fo St Sc Cu Cb Ns As Ac Hi	Amt,Fq: FC's 10,24.
11*p*	Cr Pt Fo St Sc Cu Cb Ns As Ac Hi	Fq: FC's 4,9,14,21.
11	TC Cr Fo St Sc Cu Cb Ns As Ac Hi	AFW: FC's 41-52.
10*a*	TC Fo St Sc Cu Cb Ns As Ac Hi	Amt: FC's 8,18,20,25.
10*f*	Cr Fo St Sc Cu Cb Ns As Ac Hi	Fq: FC's 29-32.
10*p*	Cr Pt St Sc Cu Cb Ns As Ac Hi	Fq: FC 19.
8*w*	St Sc Cu Cb Ns As Ac Hi	AWP: FC's 5,15.
4*u*	Ns As Ac Hi	NOL: FC's 6,16,22,33-36.
4*h*	St Sc Cu Cb	Ht: FC's 7,17,23,37-40.

TABLE 4b. DATA FILE INFORMATION for Gridded *OCEAN* Cloud Archive, *1954-1997*

File Cat.	Category abbrev.	General contents# [1502 5c or 404 10r Boxes]	Num of Types*	Logical records	Char per data_rec	fmt num	Mega-Bytes
		MULTI-YEAR AVERAGES					
11	LOCA	LAND + OCEAN CLOUD AMOUNT [5c]#	14	127,470	46	121	5.86
12	OMAA	Mean Annual Cloud AMOUNT	14	21,042	46	121	0.97
13	OMSA	Mean Seasonal Cloud AMOUNT	12*l*	72,144	46	121	3.32
14	OMSF	Mean Seasonal Cloud FREQUENCY	11*p*	66,132	46	121	3.04
15	OMSW	Mean Seasonal AMOUNT-WHEN-PRESENT	8*w*	48,096	46	121	2.21
15	*O10W*	*Mean Seasonal AMOUNT-WHEN-PRESENT*	*8w*	*12,960*	*46*	*121*	*0.60*
16	OMSU	Mean Seasonal Mid, Hi Cloud NON-OVERLAPPED AMOUNT	4*u*	24,048	46	121	1.11
16	*O10U*	*Mean Seasonal Mid, Hi Cloud NON-OVERLAPPED AMOUNT*	*4u*	*6,480*	*46*	*121*	*0.30*
17	OMSH	Mean Seasonal Low Cloud BASE HEIGHT	4*h*	24,048	46	122	1.11
17	*O10H*	*Mean Seasonal Low Cloud BASE HEIGHT*	*4h*	*6,480*	*46*	*122*	*0.30*
18	OMMA	Mean Monthly Cloud AMOUNT [10r]	10*a*	48,600	46	121	2.23
		Mean Seasonal Cloud Amount	*10a*	*16,200*	*46*	*121*	*0.74*
19	OMMF	Mean Monthly Cloud FREQUENCY	10*p*	48,600	46	121	2.23
		Mean Seasonal Cloud Frequency	*10p*	*16,200*	*46*	*121*	*0.74*
		by Synoptic Hour:					
20	OSAT	Mean Seasonal Cloud AMOUNT	10*a*	16,200	8*20	138	2.57
21	OSFT	Mean Seasonal Cloud FREQUENCY	10*p*	16,200	8*20	138	2.57
22	OSUT	Mean Seasonal Mid, Hi Cloud NON-OVERLAPPED AMOUNT	4*u*	6,480	8*20	138	1.03
23	OSHT	Mean Seasonal Low Cloud BASE HEIGHT	4*h*	6,480	8*20	138	1.03
24	OHRM	Harmonics: ANNUAL, DIURNAL	12	46,960	26	140	1.22
		INDIVIDUAL-YEAR AVERAGES					
25	OSMA	Seasonal Mean Cloud AMT, DJF	10*a*	4,050	46*48	226	8.92
26	OSMA	Seasonal Mean Cloud AMT, MAM	10*a*	4,050	46*48	226	8.92
27	OSMA	Seasonal Mean Cloud AMT, JJA	10*a*	4,050	46*48	226	8.92
28	OSMA	Seasonal Mean Cloud AMT, SON	10*a*	4,050	46*48	226	8.92
29	OSMF	Seasonal Mean Cloud FQ, DJF	10*f*	4,050	46*48	226	8.92
30	OSMF	Seasonal Mean Cloud FQ, MAM	10*f*	4,050	46*48	226	8.92
31	OSMF	Seasonal Mean Cloud FQ, JJA	10*f*	4,050	46*48	226	8.92
32	OSMF	Seasonal Mean Cloud FQ, SON	10*f*	4,050	46*48	226	8.92
33	OSMU	Seasonal Mean Mid,Hi NOL, DJF	4*u*	1,620	46*48	226	3.57
34	OSMU	Seasonal Mean Mid,Hi NOL, MAM	4*u*	1,620	46*48	226	3.57
35	OSMU	Seasonal Mean Mid,Hi NOL, JJA	4*u*	1,620	46*48	226	3.57
36	OSMU	Seasonal Mean Mid,Hi NOL, SON	4*u*	1,620	46*48	226	3.57
37	OSMH	Seasonal Mean Low Base HGT, DJF	4*h*	1,620	46*48	227	3.57
38	OSMH	Seasonal Mean Low Base HGT, MAM	4*h*	1,620	46*48	227	3.57
39	OSMH	Seasonal Mean Low Base HGT, JJA	4*h*	1,620	46*48	227	3.57
40	OSMH	Seasonal Mean Low Base HGT, SON	4*h*	1,620	46*48	227	3.57
41	OMYD	Monthly Day AMT, FQ, AWP JAN	11	4,455	44*34	162	6.65
|		|					
52	OMYD	Monthly Day AMT, FQ, AWP DEC	11	4,455	44*34	162	6.65
11-52							213.49

* The specific cloud types given within each category are listed in footnote to Table 4a.

\# File 11 for land + ocean averages uses all 1820 5c grid boxes.
Files 1-17 are given on the 5c grid^; Files 18-52 are given on the 10r grid.

^ Files *15_O10W, 16_O10U, 17_O10H* are given on the 10r grid.

TABLE 5a. DATA ORGANIZATION for Gridded *LAND* Cloud Archive, *1971-96*.
File-sequence-numbers (FSN) are listed for each type, for each season in the File Category listed. Cloud types are listed by both numerical code and abbreviation. `MGRP# (or BGRP#) = FC x1000 + FSN.`
See Tables 6 & 7 for definitions of terms and abbreviations.

GLOBAL GRIDs INFO

File Cat.	Num_of MGRPs	MGRP Numbers	Contents	(Abbrev.)	fmt
01	2	01001-2	Grid Lat-Lon, Land-Fraction	(BLLF)	115

FSN		
1	1820	5x5c Boxes
2	456	10x10r Boxes

MEAN-ANNUAL* AMOUNT LAND, 5c Grid (820 Land B5c's)

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
02	14	02001-14	Mean-Annual Cloud AMOUNT or FQ	(LMAA)	121

ANN	TC	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi	MiL	LoL
FSN:	1	2	3	4	5	6	7	8	9	10	11	12	13	14

MEAN-SEASONAL* AVERAGES LAND, 5c Grid (820 Land B5c's)

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
03	48	03001-48	Mean-Seasonal Cloud AMOUNT	(LMSA)	121

Type	DJF	MAM	JJA	SON
1 TC	1	13	25	37
2 Fo	2	14	26	38
3 St	3	15	27	39
4 Sc	4	16	28	40
5 Cu	5	17	29	41
6 Cb	6	18	30	42
7 Ns	7	19	31	43
8 As	8	20	32	44
9 Ac	9	21	33	45
10 Hi	10	22	34	46
11 MiL	11	23	35	47
12 LoL	12	24	36	48

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
04	44	04001-44	Mean-Seasonal Cloud FREQUENCY	(LMSF)	121

Type	DJF	MAM	JJA	SON
1 Cr	1	12	23	34
2 Pt	2	13	24	35
3 Fo	3	14	25	36
4 St	4	15	26	37
5 Sc	5	16	27	38
6 Cu	6	17	28	39
7 Cb	7	18	29	40
8 Ns	8	19	30	41
9 As	9	20	31	42
10 Ac	10	21	32	43
11 Hi	11	22	33	44

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
05	32	05001-32	Mean-Seasonal AMOUNT-WHEN-PRESENT	(LMSW)	121

Type	DJF	MAM	JJA	SON
1 St	1	9	17	25
2 Sc	2	10	18	26
3 Cu	3	11	19	27
4 Cb	4	12	20	28
5 Ns	5	13	21	29
6 As	6	14	22	30
7 Ac	7	15	23	31
8 Hi	8	16	24	32

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
06	16	06001-16	Mean-Seasonal NON-OVERLAPPED AMOUNT Mid & Hi Clouds	(LMSU)	121

Type	DJF	MAM	JJA	SON
1 Ns	1	5	9	13
2 As	2	6	10	14
3 Ac	3	7	11	15
4 Hi	4	8	12	16

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
07	16	07001-16	Mean-Seasonal BASE HEIGHT Low Clouds	(LMSH)	122

Type	DJF	MAM	JJA	SON
1 St	1	5	9	13
2 Sc	2	6	10	14
3 Cu	3	7	11	15
4 Cb	4	8	12	16

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cont.

TABLE 5a. DATA ORGANIZATION for Gridded *LAND* Cloud Archive, *cont.*

MEAN-MONTHLY* AVERAGES LAND, 5c Grid (820 B5c's)

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
08	120	08001-120	Mean-Monthly Cloud **AMOUNT**	(**LMMA**)	121

Type:	1_TC	2_Fo	3_St	4_Sc	5_Cu	6_Cb	7_Ns	8_As	9_Ac	10_Hi
1 Jan	1	2	3	4	5	6	7	8	9	10
2 Feb	11	12	13	14	15	16	17	18	19	20
3 Mar	21	22	23	24	25	26	27	28	29	30
4 Apr	31	32	33	34	35	36	37	38	39	40
5 May	41	42	43	44	45	46	47	48	49	50
6 Jun	51	52	53	54	55	56	57	58	59	60
7 Jul	61	62	63	64	65	66	67	68	69	70
8 Aug	71	72	73	74	75	76	77	78	79	80
9 Sep	81	82	83	84	85	86	87	88	89	90
10 Oct	91	92	93	94	95	96	97	98	99	100
11 Nov	101	102	103	104	105	106	107	108	109	110
12 Dec	111	112	113	114	115	116	117	118	119	120

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
09	132	09001-132	Mean-Monthly Cloud **FREQUENCY**	(**LMMF**)	121

	1_Cr	2_Pt	3_Fo	4_St	5_Sc	6_Cu	7_Cb	8_Ns	9_As	10_Ac	11_Hi
1 Jan	1	2	3	4	5	6	7	8	9	10	11
2 Feb	12	13	14	15	16	17	18	19	20	21	22
3 Mar	23	24	25	26	27	28	29	30	31	32	33
4 Apr	34	35	36	37	38	39	40	41	42	43	44
5 May	45	46	47	48	49	50	51	52	53	54	55
6 Jun	56	57	58	59	60	61	62	63	64	65	66
7 Jul	67	68	69	70	71	72	73	74	75	76	77
8 Aug	78	79	80	81	82	83	84	85	86	87	88
9 Sep	89	90	91	92	93	94	95	96	97	98	99
10 Oct	100	101	102	103	104	105	106	107	108	109	110
11 Nov	111	112	113	114	115	116	117	118	119	120	121
12 Dec	122	123	124	125	126	127	128	129	130	131	132

HARMONIC ANALYSES (Annual & Diurnal) **LAND,** 5c Grid (820 B5c's)

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
10*a*	21	10001-21	Mean-Annual* **ANNUAL CYCLES**	(**LHRM**)	140

AMT:	TC		Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
FSN:	1		2	3	4	5	6	7	8	9	10

FQ:	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
FSN:	11	12	13	14	15	16	17	18	19	20	21

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
10d	84	10022-105	Mean-Seasonal* **DIURNAL CYCLES**	(**LHRM**)	148

AMT	**DJF**	**MAM**	**JJA**	**SON**
1 TC	22	32	42	52
2 Fo	23	33	43	53
3 St	24	34	44	54
4 Sc	25	35	45	55
5 Cu	26	36	46	56
6 Cb	27	37	47	57
7 Ns	28	38	48	58
8 As	29	39	49	59
9 Ac	30	40	50	60
10 Hi	31	41	51	61

FQ	DJF	MAM	JJA	SON
1 Cr	62	73	84	95
2 Pt	63	74	85	96
3 Fo	64	75	86	97
4 St	65	76	87	98
5 Sc	66	77	88	99
6 Cu	67	78	89	100
7 Cb	68	79	90	101
8 Ns	69	80	91	102
9 As	70	81	92	103
10 Ac	71	82	93	104
11 Hi	72	83	94	105

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* "Mean-annual", "mean-seasonal", and "mean-monthly" signify multi-year averages.

TABLE 5b. DATA ORGANIZATION for Gridded *OCEAN* Cloud Archive, *1954-97.*

LAND + OCEAN AMOUNT, 5c Grid (1820 B5c's)

File Cat.	Num_of MGRPs	MGRP Numbers	Contents		(Abbrev.)	fmt
11	14	11001-14	Mean-Annual*	<u>Cloud AMOUNT or FQ</u>	(LOCA)	121
	56	11015-70	Mean-Seasonal*	"		

ANN	TC	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi	MiL	LoL
FSN:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DJF	TC	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi	MiL	LoL
FSN:	15	16	17	18	19	20	21	22	23	24	24	26	27	28
MAM	TC	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi	MiL	LoL
FSN:	29	30	31	32	33	34	35	36	37	38	39	40	41	42
JJA	TC	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi	MiL	LoL
FSN:	43	44	45	46	47	48	49	50	51	52	53	54	55	56
SON	TC	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi	MiL	LoL
FSN:	57	58	59	60	61	62	63	64	65	66	67	68	69	70

MEAN-ANNUAL* AMOUNT OCEAN, 5c Grid (1502 Ocean B5c's)

FC	#MGRPs	MGRP#s	Contents		(Abbrev.)	fmt
12	14	12001-14	Mean-Annual*	<u>Cloud AMOUNT or FQ</u>	(OMAA)	121

ANN	TC	Cr	Pt	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi	MiL	LoL
FSN:	1	2	3	4	5	6	7	8	9	10	11	12	13	14

MEAN-SEASONAL* AVERAGES OCEAN, (1502 **B5c**'s or 404 **B10r**'s)

Cat.	#MGRPs	MGRP#s	Contents		(Abbrev.)	fmt
13	48	13001-48	Mean-Seasonal	<u>Cloud AMOUNT</u>	(OMSA)	121

	Type	DJF	MAM	JJA	SON
5c	1 TC	1	13	25	37
	2 Fo	2	14	26	38
	3 St	3	15	27	39
	4 Sc	4	16	28	40
	5 Cu	5	17	29	41
	6 Cb	6	18	30	42
	7 Ns	7	19	31	43
	8 As	8	20	32	44
	9 Ac	9	21	33	45
	10 Hi	10	22	34	46
	11 Mil	11	23	35	47
	12 Lol	12	24	36	48

Cat.	#MGRPs	MGRP#s	Contents		(Abbrev.)	fmt
14	44	14001-44	Mean-Seasonal	<u>Cloud FREQUENCY</u>	(OMSF)	121

	Type	DJF	MAM	JJA	SON
5c	1 Cr	1	12	23	34
	2 Pt	2	13	24	35
	3 Fo	3	14	25	36
	4 St	4	15	26	37
	5 Sc	5	16	27	38
	6 Cu	6	17	28	39
	7 Cb	7	18	29	40
	8 Ns	8	19	30	41
	9 As	9	20	31	42
	10 Ac	10	21	32	43
	11 Hi	11	22	33	44

Cat.	#MGRPs	MGRP#s	Contents		(Abbrev.)	fmt
15	64	15001-64	Mean-Seasonal	<u>AMOUNT-WHEN-PRESENT</u>	(OMSW)	121

	Type	DJF	MAM	JJA	SON	(Abbrev.)
5c	1 St	1	9	17	25	
	2 Sc	2	10	18	26	
	3 Cu	3	11	19	27	
	4 Cb	4	12	20	28	
	5 Ns	5	13	21	29	
	6 As	6	14	22	30	
	7 Ac	7	15	23	31	
	8 Hi	8	16	24	32	
10r	1 St	33	41	49	57	(O10W)
	2 Sc	34	42	50	58	
	3 Cu	35	43	51	59	
	4 Cb	36	44	52	60	
	5 Ns	37	45	53	61	
	6 As	38	46	54	62	
	7 Ac	39	47	55	63	
	8 Hi	40	48	56	64	

cont.

TABLE 5b. DATA ORGANIZATION for Gridded *OCEAN* Cloud Archive, *cont.*

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
16	32	16001-32	Mean-Seasonal <u>NON-OVERLAPPED AMOUNT</u> Mid & Hi Clouds	(OMSU)	121

5c	1 Ns	1	5	9	13	
	2 As	2	6	10	14	
	3 Ac	3	7	11	15	
	4 Hi	4	8	12	16	
10r	1 Ns	17	21	25	29	(O10U)
	2 As	18	22	26	30	
	3 Ac	19	23	27	31	
	4 Hi	20	24	28	32	

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
17	32	17001-32	Mean-Seasonal <u>BASE HEIGHTs</u> Low Clouds	(OMSH)	122

5c	1 St	1	5	9	13	
	2 Sc	2	6	10	14	
	3 Cu	3	7	11	15	
	4 Cb	4	8	12	16	
10r	1 St	17	21	25	29	(O10H)
	2 SC	18	22	26	30	
	3 CU	19	23	27	31	
	4 CB	20	24	28	32	

MEAN-MONTHLY* *(& Seasonal)* **AVERAGES OCEAN, 10r** Grid (404 B10r's)

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
18	160	18001-160	<u>Mean-Monthly Cloud **AMOUNT**</u>	(OMMA)	121

	1_TC	2_Fo	3_St	4_Sc	5_Cu	6_Cb	7_Ns	8_As	9_Ac	10_Hi
1 Jan	1	2	3	4	5	6	7	8	9	10
2 Feb	11	12	13	14	15	16	17	18	19	20
3 Mar	21	22	23	24	25	26	27	28	29	30
4 Apr	31	32	33	34	35	36	37	38	39	40
5 May	41	42	43	44	45	46	47	48	49	50
6 Jun	51	52	53	54	55	56	57	58	59	60
7 Jul	61	62	63	64	65	66	67	68	69	70
8 Aug	71	72	73	74	75	76	77	78	79	80
9 Sep	81	82	83	84	85	86	87	88	89	90
10 Oct	91	92	93	94	95	96	97	98	99	100
11 Nov	101	102	103	104	105	106	107	108	109	110
12 Dec	111	112	113	114	115	116	117	118	119	120
13 DJF	121	122	123	124	125	126	127	128	129	130
14 MAM	131	132	133	134	135	136	137	138	139	140
15 JJA	141	142	143	144	145	146	147	148	149	150
16 SON	151	152	153	154	155	156	157	158	159	160

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
19	160	19001-160	<u>Mean-Monthly Cloud **FREQUENCY**</u>	(OMMF)	121

	1_Cr	2_Pt	3_St	4_Sc	5_Cu	6_Cb	7_Ns	8_As	9_Ac	10_Hi
1 Jan	1	2	3	4	5	6	7	8	9	10
2 Feb	11	12	13	14	15	16	17	18	19	20
3 Mar	21	22	23	24	25	26	27	28	29	30
4 Apr	31	32	33	34	35	36	37	38	39	40
5 May	41	42	43	44	45	46	47	48	49	50
6 Jun	51	52	53	54	55	56	57	58	59	60
7 Jul	61	62	63	64	65	66	67	68	69	70
8 Aug	71	72	73	74	75	76	77	78	79	80
9 Sep	81	82	83	84	85	86	87	88	89	90
10 Oct	91	92	93	94	95	96	97	98	99	100
11 Nov	101	102	103	104	105	106	107	108	109	110
12 Dec	111	112	113	114	115	116	117	118	119	120
13 DJF	121	122	123	124	125	126	127	128	129	130
14 MAM	131	132	133	134	135	136	137	138	139	140
15 JJA	141	142	143	144	145	146	147	148	149	150
16 SON	151	152	153	154	155	156	157	158	159	160

cont.

TABLE 5b. DATA ORGANIZATION for Gridded *OCEAN* Cloud Archive, *cont.*

Mean-Seasonal-by-SYNOPTIC-HOUR* AVERAGES OCEAN, 10r Grid (404 B10r's)

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
20	40	20001-40	Mean-Seasonal Cloud AMOUNT by HOUR	(OSAT)	138

	DJF	MAM	JJA	SON
1 TC	1	11	21	31
2 Fo	2	12	22	32
3 St	3	13	23	33
4 Sc	4	14	24	34
5 Cu	5	15	25	35
6 Cb	6	16	26	36
7 Ns	7	17	27	37
8 As	8	18	28	38
9 Ac	9	19	29	39
10 Hi	10	20	30	40

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
21	40	21001-40	Mean-Seasonal Cloud FREQUENCY by HOUR	(OSFT)	138

1 Cr	1	11	21	31
2 Pt	2	12	22	32
3 St	3	13	23	33
4 Sc	4	14	24	34
5 Cu	5	15	25	35
6 Cb	6	16	26	36
7 Ns	7	17	27	37
8 As	8	18	28	38
9 Ac	9	19	29	39
10 Hi	10	20	30	40

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
22	16	22001-16	Mean Seasonal NON-OVERLAPPED AMOUNT by HOUR	(OSUT)	138

1 Ns	1	5	9	13
2 As	2	6	10	14
3 Ac	3	7	11	15
4 Hi	4	8	12	16

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
23	16	23001-16	Mean-Seasonal BASE HEIGHT by HOUR	(OSHT)	139

1 St	1	5	9	13
2 Sc	2	6	10	14
3 Cu	3	7	11	15
4 Cb	4	8	12	16

HARMONIC ANALYSES (Annual & Diurnal) OCEAN, 10r Grid (404 B10r's)

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
24a	20	24001-20	Mean-Annual* ANNUAL CYCLES Amt,Fq	(OHRM)	140

AMT:	TC	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
	1	2	3	4	5	6	7	8	9	10
FQ:	Cr	Pt	St	Sc	Cu	Cb	Ns	As	Ac	Hi
	11	12	13	14	15	16	17	18	19	20

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
24d	80	24021-100	Mean-Seasonal* DIURNAL CYCLES Amt,Fq	(OHRM)	148

AMT	DJF	MAM	JJA	SON
1 TC	21	31	41	51
2 Fo	22	32	42	52
3 St	23	33	43	53
4 Sc	24	34	44	54
5 Cu	25	35	45	55
6 Cb	26	36	46	56
7 Ns	27	37	47	57
8 As	28	38	48	58
9 Ac	29	39	49	59
10 Hi	30	40	50	60

FQ	DJF	MAM	JJA	SON
1 Cr	61	71	81	91
2 Pt	62	72	82	92
3 St	63	73	83	93
4 Sc	64	74	84	94
5 Cu	65	75	85	95
6 Cb	66	76	86	96
7 Ns	67	77	87	97
8 As	68	78	88	98
9 Ac	69	79	89	99
10 Hi	70	80	90	100

FC	#MGRPs	MGRP#s	Contents	(Abbrev.)	fmt
24	16	24101-116	Mean-Seasonal* DIURNAL CYCLES Ht	(OHRM)	149

Ht	DJF	MAM	JJA	SON
1 St	101	105	109	113
2 Sc	102	106	110	114
3 Cu	103	107	111	115
4 Cb	104	108	112	116

cont.

TABLE 5b. DATA ORGANIZATION for Gridded *OCEAN* Cloud Archive, *cont.*

Seasonal-Mean# **AVERAGES OCEAN, 10r** Grid (404 B10r's)

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
25-28	10*4	25001-28010	Seasonal-Mean <u>Cloud AMOUNT</u>	(OSMA)	226

	<u>AMT</u>:	TC	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
25	DJF	1	2	3	4	5	6	7	8	9	10
26	MAM	1	2	3	4	5	6	7	8	9	10
27	JJA	1	2	3	4	5	6	7	8	9	10
28	SON	1	2	3	4	5	6	7	8	9	10

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
29-32	10*4	29001-32010	Seasonal-Mean <u>Cloud FREQUENCY</u>	(OSMF)	226

	<u>FQ</u>:	Cr	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
29	DJF	1	2	3	4	5	6	7	8	9	10
30	MAM	1	2	3	4	5	6	7	8	9	10
31	JJA	1	2	3	4	5	6	7	8	9	10
32	SON	1	2	3	4	5	6	7	8	9	10

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
33-36	4*4	33001-33004	Seasonal-Mean <u>NOL Amount</u>	(OSMU)	226

	<u>NOL</u>:	Ns	As	Ac	Hi
33	DJF	1	2	3	4
34	MAM	1	2	3	4
35	JJA	1	2	3	4
36	SON	1	2	3	4

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
37-40	4*4	37001-40004	Seasonal-Mean <u>BASE HEIGHT</u>	(OSMH)	227

	<u>HGT</u>:	St	Sc	Cu	Cb
37	DJF	1	2	3	4
38	MAM	1	2	3	4
39	JJA	1	2	3	4
40	SON	1	2	3	4

Monthly-Mean# Daytime **AVERAGES OCEAN, 10r** Grid (404 B10r's)

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
41-52	11*12	41001-52011	Monthly-Mean,Dy <u>Cloud Amt,Fq,AWP</u>	(OMYD)	162

	<u>AFW</u>:	TC	Cr	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
41	Jan	1	2	3	4	5	6	7	8	9	10	11
42	Feb	1	2	3	4	5	6	7	8	9	10	11
43	Mar	1	2	3	4	5	6	7	8	9	10	11
44	Apr	1	2	3	4	5	6	7	8	9	10	11
45	May	1	2	3	4	5	6	7	8	9	10	11
46	Jun	1	2	3	4	5	6	7	8	9	10	11
47	Jul	1	2	3	4	5	6	7	8	9	10	11
48	Aug	1	2	3	4	5	6	7	8	9	10	11
49	Sep	1	2	3	4	5	6	7	8	9	10	11
50	Oct	1	2	3	4	5	6	7	8	9	10	11
51	Nov	1	2	3	4	5	6	7	8	9	10	11
52	Dec	1	2	3	4	5	6	7	8	9	10	11

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* "Mean-annual", "mean-seasonal", and "mean-monthly" signify multi-year averages.
# "Seasonal-mean" and "monthly-mean" signify individual-year averages.

TABLE 6a. HEADER RECORD FORMATs (110, 120 & 220[#]) AND CODES*
Used in NDP-026E

Format	I5	I5	I3	I2	I3	I2	I5	I3	I4	(I4 I4.0)
Parameter	DGRP	NBXS	GRID	LO	TYPE	PCODE	YEAR	SN	FMT	(MIN VX)
Values	01001	1820	5	1=Land	1=Tc	0=AFW	1952	0=ANN	115	
	│	1502	10	2=Ocean	2=Cr	1=AMT	│		121	
	52011	820		3=La+Oc	3=Pt	2=FQ	1971	1=Jan	122	
		456			11=Fo	3=AWP	│	│	226	
		404			12=St	4=NOL	1996	12=Dec	227	
					13=Sc	5=HGT	1997		138	
					14=Cu		8291	41=DJF	139	
					15=Cb		7196	42=MAM	140	
					21=Ns		5297	43=JJA	148	
					22=As		5497	44=SON	162	
					23=Ac					
					30=Hi					
					20=MiL					
					10=LoL					

[#] Format 220 contains 2 more variables than 120 (min, vx); used with ocean data.
* Terms are defined in text or in Tables 2 & 7.

TABLE 6b. DATA FORMATS FOR READING NDP-026E

Format number	Variables & Format	(Num of chars in record)	Files[f] in which used
110	I5 I5 I3 I2 I3 I2 I5 I3 I4 DGRP NBXS GRID LO -9 -9 YR -9 FMT	(32)	FC1 Header^
115	I4 F6.2 F6.2 F6.4 I4 I4 BOX cLAT cLON FRL LOB NStB	(30)	FC1 Data
211	i4 i3 i3 i3 i3 i3 i3 i6 i3 i3 b10r nyrd spnd nyrn spnn nyrdn spndn maxob yfd yld	(34)	Ancillary Data
-------			
120	I5 I5 I3 I2 I3 I2 I5 I3 I4 DGRP NBXS GRID LO TYPE PCODE YR SN FMT	(32)	Header FC1-10
220	I5 I5 I3 I2 I3 I2 I5 I3 I4 I4 I4.0 DGRP NBXS GRID LO TYPE PCODE YR SN FMT MIN VX	(40)	Header FC11-52
---			Data:
121	I5 I7 F6.2 I7 F6.2 I7 F6.2 I2 BOX *Nob*Dy AvgDy NobNt AvgNt NobDN AvgDN Acode	(46)	FC3-6,8-9,11 FC13-16,18-19
or	BOX *NSN*dy AvgDy NSNnt AvgNt NSNdn AvgDN Acode		FC2,11, 12
122	I5 I7 F6.0 I7 F6.0 I7 F6.0 I2 BOX NCdy AvgDy NCnt AvgNt NCDN AvgDN Acode	(46)	FC7,17
140	I5 F5.2 F5.2 F4.1 I3 F4.1 BOX PHASE AMP VAF NT AVG	(26)	FC10,24
148	" " " " " "		
149	I5 F5.2 F5.0 F4.1 I3 F4.0		

138	8(I5 I3 I6 F6.2) BOX HR Nobs Avg	(8x 20)[@]	FC20-22
139	8(I5 I3 I6 F6.0)		FC23
226	46(I4 I3 I7 F6.2 I7 F6.2 I7 F6.2 I2) BOX Yr NobD AvgDy NobN AvgNt NobDN AvgDN Acode	(46x 48)[@]	FC25-36
227	44(I4 I3 I7 F6.0 I7 F6.0 I7 F6.0 I2)		FC37-40

162	46(I5 I3 I4 F6.2 F6.2 F6.2 I4) BOX YR Nobs Amt Fq AWP NC	(44x 34)[@]	FC41-52

^ The value "-9" in Format 110 means that the variable is not applicable.
[f] File Categories (FC 1-52) are listed in Tables 4 & 5 and discussed in Section 6.
[@] 20 (or 48 or 34) char/data_line, but 8 TPs (or 46 OR 44 yrs) consecutively for each box.

TABLE 7. GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Meaning and description
AC	Acode.
Acode	"Averaging code" for AvgDN (used in formats 121 & 226); indicates relations between NobDy, NobNt and min:

Acode	Nobs	AvgDN
0	0	missing value entered
1	NobDy + NobNt < min	average of all obs [except awp=amt/fq]
2	NobDy>min and NobNt>min	(AvgDy+AvgNt)/2 [except awp=amt/fq and Ht weighted by FqD & FqN]
3	NobDy + NobNt > min [but NobD<min and/or NobN<min]	average of all obs [except awp=amt/fq]

Except in FC_11 where Acode 1= land-only, 2= ocean-only, 3= land&ocean data.

Term	Meaning and description
AFW	Amount, Frequency, Amount-When-Present.
AMP	Absolute amplitude of first harmonic (not normalized).
Amt	Amount of cloud cover (fraction of the sky covered by cloud; given here in percent).
ANN	Annual.
Avg	Average (of Amt, Fq, AWP, NOL, Ht, or Pt).
AvgDy, AvgNt	Average of daytime or nighttime obs.
AvgDN	Average over day and night ("diurnal" average).
AWP	Amount-When-Present; amount of sky covered by a cloud type when that cloud type is present.
B10r	One of 456 grid boxes on the 10r grid (Table 3). The boxes are numbered eastward (beginning at the Greenwich Meridian) and north-to-south.
B5c	One of 1820 grid boxes on the 5c grid (Table 3). The boxes are numbered eastward (beginning at the Greenwich Meridian) and north-to-south.
BGRP	Box Group number. Aid in identifying data. Unique sequence number {= FC x1000 + FSN} identifying a list of grid boxes, each of which has an associated string of related data records, such as averages for 8 hrs or 44 yrs (formats 138 or 162).
Box	A grid box on one of the grids used (Table 3).
bias fraction	fb; fraction of cloud reports not giving cloud-type data. Determined as: fraction of the reports with N>0 that have CL=/.
Cat.	Category.
Char	Character.
cLat,cLon	Center latitude (90 to -90) and center longitude (0-360E) of a grid box.
COADS	Comprehensive Ocean-Atmosphere Data Set (Worley et al. 2005; Woodruff et al. 1987).
DGRP	Data group; generic for MGRP or BGRP.
day	Refers to either the full 24-hour day or to "daytime" (q.v.), depending on context.
daytime	Local time 06-18. Abbreviations used are Dy and D.
diurnal average	Averaged over the 24-hour day.
diurnal cycle	Variation of a quantity over the 24-hour period.
Dy	Abbreviation or suffix meaning "daytime".
DJF	December, January, February.
DN	Referring to "diurnal", as in AvgDN.
EECRA	Extended Edited Cloud Report Archive (H99).
EECR	A report in the EECRA.
fb	Bias fraction (q.v.).
FC	Abbreviation for "File Category" (see Table 4). Plural is FCs.
FMT	Data format number (see Table 6).
Fq	Frequency of occurrence.
FRL	Fraction of a grid box that is land.

cont.

TABLE 7 *cont.* GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Meaning and description
FSN	File Sequence Number (used in Table 5).
GMT	Greenwich Mean Time.
Ht	Low cloud base height (given in meters).
HR	Hour (00, 03, 06, 09, 12, 15, 18, 21 GMT).
Hobs	Number of obs with cloud information for the high level.
i3-hrly	Intermediate 3-hourly times (03,09,15,21 GMT).
illuminance criterion	See sky-brightness criterion.
JJA	June, July, August.
light obs	Obs that satisfy the illuminance criterion of H95.
La	Land.
Lat	Latitude (-90 to 90 degrees North).
Lon	Longitude (0 to 360 degrees East).
LO	A variable in header formats 110, 120, and 220 which indicates whether the data in the file are for: 1=Land, 2=Ocean, 3=Land and Ocean combined.
LOB	A variable in data format 115 which indicates whether the grid box contains: 1=Land only, 2=Ocean only, 3=Land and Ocean, 12=small island with weather station, 21=large lake with ships; negative suggests the box should be excluded for ocean cloud types.
Lobs	Number of obs with cloud information for the low level.
LoL	Sum of all clouds in the low level (Fo+St+Sc+Cu+Cb).
Long-Term avgs	Averages computed over the period of record used here.
Low	Low-level cloud types (Fo, St, Sc, Cu, Cb).
LT	Local time; determined from Lon in File Cat. 1.
MAM	March, April, May.
maxob	Maximum daytime obs for the box in *any* individual year; used in format 211.
Mcode	Missing-value code (q.v.).
mean seasonal	Average over multiple years (1971-96 or 1954-97) for a season.
MGRP	Map Group number (= FC x1000 + FSN). Aid in identifying data. Unique sequence number identifying a string of data records from which a map of a variable could be produced.
Mid	Middle level cloud types (Ns, As, Ac).
MiL	Sum of all clouds in the middle level (Ns+As+Ac).
min, minobs	Generally, a minimum number of obs we required for computing an average. In formats 121 & 226, the "min" variable is used to determine the Acode for computing AvgDN.
mina	Minimum NC required for computing amounts for Hi or Mid clouds (mina = minobs x Fq x 0.6).
missing-value code	Mcode. The integer -90000 (-900 for ht and harmonic parameters); put in data record where no legitimate value is computed.
mn(s)	Month(s) (Jan,Feb,Mar,Apr,May,Jun,Jul,Aug,Sep,Oct,Nov,Dec).
Mobs	Number of obs with cloud information for the middle level.
MY	Multi-year.
N	1) Number (of obs, etc.); used with other abbreviations. 2) Used as suffix for "night" (as in "NobN"). 3) Symbol for total cloud cover in the WMO Synoptic Code.)
N3	Sum of Nobs contained in the intermediate 3-hourly times (03,09,15,21 GMT).
N6	Sum of Nobs contained in the 6-hourly times (00,06,12,18 GMT).
NBXS	Number of grid boxes listed in the data group; used in header formats 110, 120, 220.
NC	Nobs with cloud type present and amount (or height) computable.
night(time)	Local time 18-06. Abbreviations used are Nt and N.
Nobs	Number of obs; generic for Tobs, Lobs, Mobs, Hobs, NTy, NC.

cont.

TABLE 7 *cont.* GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Meaning and description
NobDy,NobNt,NobDN	Number of obs for day, night, or diurnal.
NOL	Non-overlapped amount; the amount of a cloud visible from below.
nyrd,nyrn,nyrdn	Number of years with minobs contributing to data in the box for day, night, or diurnal average; used in format 211.
NSN	Number of seasons contributing to the annual average.
NStB	Number of land stations used in a grid box (fmt_115; negative if observations covered only a few years or were rare at night).
Nt	Abbreviation or suffix for "nighttime" (distinct from NT).
NT	Number of hours used (4 or 8) for analysis of diurnal cycle or number of months used (12) for analysis of annual cycle.
NTy	Number of times a cloud type was reported present.
Num	Number.
obs	Cloud reports or observations.
Oc	Ocean.
PC	Pcode (q.v.).
Pcode	Parameter code: 0=AFW, 1=Amt, 2=Fq, 3=AWP, 4=NOL, 5=Ht.
PHASE	Phase of first harmonic (time of maximum). Diurnal: 0-24 hours mean solar time of box center; when indeterminate (AMP=0), value was set to "-899". Annual: month (0.5 to 12.4 [1.0 = mid January, etc.]; 0 if AMP=0).
Pt	Precipitation.
seasonal mean	Average for an individual year for a particular season.
sky-brightness criterion	From H95; also called the illuminance criterion or the moonlight criterion; approximately equivalent to a half moon overhead or a full moon at least 6 deg above the horizon or the sun at most 9 deg below the horizon.
SN	Season or month indicator in header record or file names.
SON	September, October, November.
syrd,syrn,syrdn	Span of years with minobs contributing to data in the box for day, night, or diurnal average; used in format 211.
Tobs	Number of obs that give total cloud cover.
TYPE	Cloud-type code as defined in Table 6b.
upper cloud	Clouds in middle or high levels.
VAF	Percent variance accounted for by the first harmonic.
vx	An optional variable in header format 220; its meaning varies with the File Category. In most cases it gives the minobs used for including an average in a data record; this differs from "min" which is used to determine the Acode (q.v.). In FC_11 the *vx* variable is used to show the minobs used for including ocean data, while the *min* variable is used to show the minobs used for including land data. In FCs 41-52 *vx* variable is used to show the minobs applied to NC for including *awp* in the data record, while the *min* variable is applied to Nobs for including *fq* or *amt*. Alternative uses for the variable *vx* occur in FCs 10 & 24: for diurnal cycles *vx* gives the maximum allowed ratio of N6/N3 for using eight hours rather than four; for annual cycles *vx* gives the minobs for using daytime averages when DN averages cannot be used.
WMO	World Meteorological Organization.
YEAR, YR	Year(s) that apply to a data group. Coded as 19yr or as yfyl for multi-year averages where yf=yr of the first year and yl=yr of the last year of the period analyzed. Example: "7196" means 1971 through 1996 and "56" means 1956.
yfd,yld	First and last year with minobs (daytime) contributing to data in the box; used in format 211.

TABLE 8. EXAMPLES OF DATA FILE CONTENTS IN NDP-026E

```
Example              Header* and sample Data^ Records                     Comments
   File_name         *DGRP NBxs G LO Ty PC YRs SN FMT@{min vx}
_________________    __________________________________________________  _________________

(a) 01_BLLF.5c       01001 1820  5 1 -9-9 5497 -9 115                     (Sec 6.1)
                        1  8750     0     0   2   0                       N.Polar
                      238  4750 23750  8849   3  10                       coastal
                      243  4750 26250 10000   1   4                       inland
                      246  4750 27750 10000 -21   6                       lake
                      250  4750 29750  4157  -3   3                       gulf
                      252  4750 30750  2196   3   5                       coastal
                      253  4750 31250     0   2   0                       Atlantic
                      435  3250 14250    11   3   0                       W.Pacific
                      502  2750 11750  9853   3  30                       coast
                     1316 -2750 22750     0  12  -1                       small island
                     1820 -8750     0 10000   1   1                       S.Polar
                      Box  cLat  cLon   FrL LOB NStB
------
(b) B10NYRS.mam      00014  456 10 2 -9-9 5297 42 211  25 {-9}           (Sec 6.1.1)
                        1 11 30 10 30 10 30    421 64 93
                        4 46 46 46 46 46 46   4249 52 97                  all yrs
                       31 45 46 45 46 45 46 13253 52 97                   max obs/year,Dy
                       60  0  0  0  0  0  0      0  0  0                  FrL 100%
                       61  2  2  0  0  0  0     43 52 53                  FrL  98%
                      129 12 40  0  0  0  0     61 52 91                  no night obs
                      253 45 46 20 30 20 30    248 52 97                  FrL   0%
                      453  8 29  6 29  6 29    119 69 97
                     B10r yd sd yn sn ydnsdn mxob yf yl

(c) B10NYRS.apr      00004  456 10 2 -9-9 5497 04 211  20 {-9}
                        1  6 28  4 20  4 20    104 64 91
                       31 43 44 43 44 43 44   4535 54 97
                      453  1  1  0  0  0  0     41 92 92                  most obs in March
------
(d) 04_LMSF.41.mh     4009  820  5 1 22 2 7196 41 121 {100  1}           (Sec 6.2)
                       261   8410   679   2273   686  10683   683 2
                       773   1527    20    168    60   1695    40 2      fq_As
                      1777    474  1245     96   521    570  1123 3
                       Box   NobDy AvgDy  NobNy AvgNy NobDN AvgDN AC

(e) 05_LMSW.41.mh     5006  820  5 1 22 3 7196 41 121 { 50   1}
                       261    541  8826    153  9068    694  8948 2
                       773      0-90000      0-90000      0-90000 0      NC=0
                      1777     57  5219      5  8750     62  5504 3

(f) 03_LMSA.41.mh     3008  820  5 1 22 1 7196 41 121 {100   1}
                       261   8410   599   2273   622  10683   611 2
                       773   1527    12    168-90000   1695-90000 0      NC<mina
                      1777    474   650     96   456    570   618 3

(g) 13_OMSA.41.mh    13008 1502  5 2 22 1 5497 41 121  50  50
                        37    184   231     71  1042    255   636 2
                       261  38277   949   9097   897  47374   923 2
                       549     69   405      0-90000     88   452 3      min=vx=50

(h) 05_LMSW.42.mh     5016  820  5 1 30 3 7196 42 121  { 50  1}
                       936   5292  4600   1573  4600   6865  4600 2      bogus_awp
                      1789     16  4896     11  4417     27  4701 1      Acode=1

(i) 15_OMSW.42.mh    15016 1502  5 2 30 3 5497 42 121  25  25
                      1786     43  4291      0-90000     56  4498 3      NobN<mx

(j) 14_OMSF.43.pt    14024 1502  5 2  3 2 8291 43 121 100   1
                       155  34014   571  16845   757  50859   664 2      box with most obs
                       182     30   667     22   455     52   577 1      Acode=1
                       822   3423  1852   2772  1328   6195  1590 2      large Pt
------
(k) 02_LMAA.tc       02001  820  5 1  1 1 7196 00 121 {100   }           (Sec 6.3)
                       629      4  2578      0-90000      4  2617 3      Annual

   03_LMSA.41.tc     03001  820  5 1  1 1 7196 41 121
                       629    348  1915     16  1563    364  1899 3      djf

   03_LMSA.42.tc     03013  820  5 1  1 1 7196 42 121
                       629    291  1735     11  2159    302  1751 3      mam

   03_LMSA.43.tc     03025  820  5 1  1 1 7196 43 121
                       629    261  4555     21  5833    282  4650 3      jja

   03_LMSA.44.tc     03037  820  5 1  1 1 7196 44 121
                       629    277  2107     15  3250    292  2166 3      son

                       Box   NobDy AvgDy  NobNy AvgNy NobDN AvgDN AC
---------------------------------------------------------------------------------
```

cont.

TABLE 8 *cont.* Examples of Data File Contents in NDP-026E

```
Example              Header* and sample Data^ Records                    Comments
   File_name         *DGRP NBxs G LO Ty PC YRs SN FMT {min vx}
_________________    _________________________________________________  _________________

(l) 11_LOCA.42.tc    11029 1820  5 3  1 1 5497 42 121 100 100          (Sec 6.4)
                       238  53345  7324  19305  6886  72650  7105 3
                      1316   1575  6447    439  6506   2014  6477 2     Ocean used

   03_LMSA.42.tc     03013  820  5 1  1 1 7196 42 121 {100  1}
                       238  42242  7331  15072  6858  57314  7095 2
                      1316   1755  6957      3  4583   1758  6953 3     Land Nt<min

   13_OMSA.42.tc     13013 1502  5 2  1 1 5497 42 121 100  25
                       238  11103  7267   4233  7102  15336  7185 2
                      1316   1575  6447    439  6506   2014  6477 2     Ocean AC=2
                       Box   NobDy AvgDy  NobNy AvgNy NobDN AvgDN AC

(m) 11_LOCA.00.tc    11001 1820  5 3  1 1 5497  0 121 100 100
                        26      0-90000      0-90000      1  7011 2     few obs Ocean
                       238      8  7032      8  6706      8  6869 3     full Land+Ocean
                       502      8  7026      5  7080      8  7048 3     mixed land&ocean
                      1316      4  6586      4  6665      4  6626 2     full Ocean

   02_LMAA.tc        02001  820  5 1  1 1 7196 00 121 {100   }
                       502      4  7024      4  7069      4  7047 2     Land:  4 sns

   12_OMAA.tc        12001 1502  5 2  1 1 5497 00 121 100 100
                       502      4  7158      1  7838      4  7114 3     Ocean: 1 sn Nt
                       Box   NsnDy AvgDy  NsnNt AvgNt NsnDN AvgDN AC
------
(n) 06_LMSU.42.mh    06005  820  5 1 21 4 7196 42 121 {100  1}         (Sec 6.5)
                       574 119663    78  33340    64 153003    71 2     nol_Ns
                      1777    367   722      3  2917    370   740 3

                     06006  820  5 1 22 4 7196 42 121 {100  1}
                       574 119663   116  33340   151 153003   133 2     nol_As
                      1777    367  1454      3  2917    370  1466 3

                     06007  820  5 1 23 4 7196 42 121 {100  1}
                       574 119663   926  33340   819 153003   873 2     nol_Ac
                      1777    367  1206      3     0    370  1196 3

                     06008  820  5 1 30 4 7196 42 121 {100  1}
                       574 119604   273  33309   204 152913   239 2     nol_Hi
                      1777    366  1492      3  1250    369  1490 3

   16_OMSU.42.mh     16008 1502  5 2 30 4 5497 42 121  50  50           Ocean Hi
                       574  21121   332   4909   260  26030   296 2
                       Box   NobDy AvgDy  NobNy AvgNy NobDN AvgDN AC
------
(o) 07_LMSH.42.low   07005  820  5 1 12 5 7196 42 122 { 50  1}         (Sec 6.6)
                        36   2453   291   2338   284   4791   287 2     ht_St
                       792     53   527     18   450     71   486 3
                     07006  820  5 1 13 5 7196 42 122 { 50  1}
                        36   3802   583   3804   610   7606   598 2     ht_Sc
                       792    950   565    263   559   1213   562 2
                     07007  820  5 1 14 5 7196 42 122 { 50  1}
                        36     87   906     45  1057    132   966 3     ht_Cu
                       792  12307   574   3806   538  16113   556 2
                     07008  820  5 1 15 5 7196 42 122 { 50  1}
                        36    149   772    130   657    279   711 2     ht_Cb
                       792   2843   528    747   509   3590   519 2

   17_OMSH.42.low    17005 1502  5 2 12 5 5497 42 122  25  25
                       792    384   349     84   371    468   360 2     Ocean St
                     17007 1502  5 2 14 5 5497 42 122  25  25
                       792   3374   547    737   514   4111   531 2     Ocean Cu
------
(p) 18_OMMA.14.mh    18139  404 10 2 23 1 5497 42 121  50  50          (Sec 6.7)
                        67  17452  1560   7210  1637  24662  1598 2     Ac at 10r

   13_OMSA.42.mh     13021 1502  5 2 23 1 5497 42 121  50  50           Ac at 5c
                       227   4331  1394   1712  1579   6043  1486 2     B5c_227
                       228   4656  1485   1998  1417   6654  1451 2     B5c_228
                       299   4016  1632   1663  1727   5679  1680 2     B5c_299
                       300   4449  1729   1837  1841   6286  1785 2     B5c_300
                       Box   NobDy AvgDy  NobNy AvgNy NobDN AvgDN AC
------------------------------------------------------------------------------------------
                                                                                     cont.
```

TABLE 8 *cont.* Examples of Data File Contents in NDP-026E

```
Example              Header* and sample Data^ Records                 Comments
   File_name         *DGRP NBxs G LO Ty PC YRs SN FMT {min vx}
_________________    _________________________________________________ _________________

(q) 21_OSFT.43.cr    21021  404 10 2  2 2 5497 43 138  25 {25}        (Sec 6.8)
                        72 00 31293   849                              LT=16 dy
                        72 03  3438   817                                 19 nt
                        72 06  5842  1084                                 22 nt
                        72 09   584  1045                                 01 nt
                        72 12 17499   879                                 04 nt
                        72 15  3623   621                                 07 dy
                        72 18 34676   673                                 10 dy
                        72 21  2812   690                                 13 dy

    21_OSFT.43.cr    21021  404 10 2  2 2 5497 43 138  25 {25}        6.8 cont.
                       166 00  1870    59                              LT=06 nt
                       166 03    48     0
                       166 06  1849    87                                 12 dy
                       166 09    49     0
                       166 12  1847    38                                 18 dy
                       166 15     0-90000
                       166 18   433   185                                 00 nt
                       166 21     0-90000

   20_OSAT.43.low    20024  404 10 2 13 1 5497 43 138  50 {50}
                       103 00 12736  2283                              LT=12 dy
                       103 03   868  2873
                       103 06 11959  2408                                 18 dy
                       103 09   166  3448
                       103 12  2469  2465                                 00 nt
                       103 15   135  2625
                       103 18 10226  2521                                 06 nt
                       103 21   884  2930
                       Box HR  Nobs   Avg
------                                                                (Sec 6.9)
(r) 10_LHRM.aa.tc    10001  820  5 1  1 1 7196  0 140 {75 100}        annual cycle
                       238  161 1200 712 12 683                        Seattle
                       386  336  534 683 12 498                        Denver
                       456   89  442 194 12 295                        Tucson
                       Box Phas  AMP VAF NT Avg

   24_OHRM.aa.tc     24001  404 10 2  1 1 5497  0 140 100 100
                        72  201  506 620 12 718                        NW USA coast
                        90  134 1715 868-12 503                        Daytime used
                       131 -900 -900-900  2-900                        Mcode

(s)10_LHRM.da.43.low 10045  820  5 1 13 1 7196 43 148 {75   4}       diurnal cycle
                       238  423  550 723  4 218                         N6/N3>4
                      1184  314 1582 725  8 366

   24_OHRM.da.43.low 24044  404 10 2 13 1 5497 43 148  75   6
                        72  473  334 796  8 315                       obs>150 in all HRs
                       293  287  370 724  4 562
                       103  246  107 553  4 242                         N6/N3>6
                       Box Phas  AMP VAF NT Avg
------
(t) 26_OSMA.42.low   26005  404 10 2 14 1 5297 42 226  25 {25}         yearly by season
                       278 52      0-90000      0-90000      0-90000 0
                        -
                       278 59      0-90000      0-90000      0-90000 0
                       278 60     39  1795      0-90000     47  1968 3
                        -
                       278 64    128  1377     45  1028    173  1202 2
                       278 65    131  1737     44  1364    175  1550 2
                       278 66     93  2097     35  1357    128  1727 2
                       278 67     82  1875     28  1563    110  1719 2
                       278 68     89  2079      0-90000    105  1988 3
                       278 69     81  1867     36   903    117  1385 2
                       278 70     92  2405      0-90000    112  2232 3
                       278 71     60  1125      0-90000     78  1346 3
                       278 72    105  1858      0-90000    126  1836 3
                       278 73    170  1868     32   791    202  1330 2
                       278 74     79  1519      0-90000     98  1645 3
                       278 75    138  1622     37  1385    175  1503 2
                       278 76    110  1182     28   313    138   747 2
                       278 77    157  1497     36   764    193  1130 2
                       278 78    100  1663     29  1810    129  1736 2
                       278 79    121  1973     28  2232    149  2103 2
                       278 80    105  2060     35  1714    140  1887 2
                       278 81     90  1875     26  1298    116  1587 2
                       Box Yr   NobDy AvgDy  NobNt AvgNt NobDN AvgDN AC
-----------------------------------------------------------------------------------------
                                                                                    cont.
```

TABLE 8 *cont.* Examples of Data File Contents in NDP-026E

```
Example             Header* and sample Data^ Records                   Comments
   File_name        *DGRP NBxs G LO Ty PC YRs SN FMT {min vx}
_________________   _________________________________________________  _________________

(t) 26_OSMA.42.low  26005  404 10 2 14 1 5297 42 226  25 {25}          yearly by season
 cont.
                      278 82    138  1906     29  1653    167  1780 2
                       -
                      278 86    170  1923     38  2036    208  1979 2
                      278 87    169  2293     34  1420    203  1857 2
                      278 93    164  2362     28  1559    192  1960 2
                      278 94     82  1829      0-90000    106  1947 3
                      278 95     95  2152      0-90000    117  2022 3
                      278 96     81  1953      0-90000     99  1769 3
                      278 97     81  2032      0-90000     96  1936 3
                      Box Yr   NobDy AvgDy  NobNt AvgNt NobDN AvgDN AC

(u) 44_OSMA.04.Hi   44011  404 10 2 30 0 5497 04 162  20  15          yearly by month,Dy
                       31 54  90  1302  5889  2212  34
                       31 55  39  1214  4206-90000   0
                       31 56   0-90000-90000-90000   0
                       31 57  33-90000  3342-90000   0
                       31 58 224  1324  3173  4171  33
                       31 59  66  1355  3791  3574  20
                       31 60  65  1661  3696  4496  17
                       31 61  94  1146  3422  3349  21
                       31 62 314  1006  3221  3122  63
                       31 63 165  1082  3119  3470  42
                       31 64 814  2440  5511  4427 401
                       31 65 561  1387  3669  3780 153
                       31 661011  1748  4344  4024 377
                       31 671555  1480  3991  3707 526
                       31 682190  1570  3842  4087 694
                       31 691646  1294  3618  3577 514
                       31 70 864  1804  3979  4533 266
                       31 71 959  1689  4086  4132 350
                       31 72 724  1227  3280  3742 154
                       31 73 641  1294  3386  3822 144
                       31 74 438  1176  3117  3774 122
                       31 75 706  1695  4709  3600 250
                       31 761056  1441  4227  3409 324
                       31 771219  1422  3842  3700 277
                       31 78 815  1613  4170  3869 211
                       31 79 728  2517  5311  4740 273
                       31 801688  1344  3676  3655 519
                       31 811670  1352  3609  3745 492
                       31 822053  1373  4205  3266 655
                       31 831481  1951  4702  4150 447
                       31 842270  1595  4329  3684 810
                       31 851408  1827  4828  3783 474
                       31 861695  1736  4742  3660 529
                       31 871785  2014  5171  3896 705
                       31 881541  1744  4866  3583 583
                       31 891096  1730  4709  3675 341
                       31 901680  1110  3351  3312 369
                       31 911181  1575  4236  3717 362
                       31 92 822  1523  3917  3889 213
                       31 931014  1879  4634  4054 332
                       31 941160  1905  4642  4104 336
                       31 951282  1641  4239  3873 331
                       31 961368  1573  4402  3574 420
                       31 971222  1919  4668  4111 346
                      Box YR Nobs  Amt    Fq   AWP  NC
```

[@] See format labels in Table 6b for more complete abbreviations of some variables listed here.

^ Only selected data records are shown in any sample data group.

* Fmt 220, used for ocean data, contains the variables *min* and *vx* to show minima applied and other selection criteria; fmt 120 used for land does not provide these variables, so the values used for land are shown here in curly brackets {min vx}. See text or glossary for various meanings of the variable *vx*.

TABLE 9. SELECTED HEADER RECORDS SHOWING MINIMA USED

First and/or last header records are listed for data groups 2-52 (or as needed to exemplify mins).
Fmt 220 for ocean contains *min* & *vx* but fmt 120 for land does not; this table includes "{min, vx}" after the land header to show the mins used. For ocean, lower mins were used for types than for TC.

FC_FileName	Dgrp	NBoxs	G	lo	Ty	p	yr	sn	fmt	(min vx)	Num_Boxes_Filled
02_LMAA.tc	2001	820	5	1	1	1	7196	00	121	{100 100}	817 (nsn=4)
02_LMAA.mll	2014	820	5	1	10	1	7196	00	121		816
03_LMSA.41.tc	3001	820	5	1	1	1	7196	41	121	{100 1}	811 (AC=2)
03_LMSA.44.mll	3048	820	5	1	10	1	7196	44	121		805 to 811
04_LMSF.41.cr	4001	820	5	1	2	2	7196	41	121	{100 1}	811
04_LMSF.44.mh	4044	820	5	1	30	2	7196	44	121		804 to 810
05_LMSW.41.low	5001	820	5	1	12	3	7196	41	121	{ 50 1}	476 to 748
05_LMSW.44.mh	5032	820	5	1	30	3	7196	44	121		551 to 789
06_LMSU.41.mh	6001	820	5	1	21	4	7196	41	121	{100 1}	811
06_LMSU.44.mh	6016	820	5	1	30	4	7196	44	121		811
07_LMSH.41.low	7001	820	5	1	12	5	7196	41	122	{ 50 1}	460 to 742
07_LMSH.44.low	7016	820	5	1	15	5	7196	44	122		563 to 748
08_LMMA.01.tc	8001	820	5	1	1	1	7196	1	121	{ 75 1}	800 (AC=2)
09_LMMF.12.mh	9132	820	5	1	30	2	7196	12	121		799 to 800
10_LHRM.aa.tc	10001	820	5	1	1	1	7196	0	140	{75 100}	791_dn +21_dy
10_LHRM.af.mh	10021	820	5	1	30	2	7196	0	140		771_dn +38_dy
10_LHRM.da.41.tc*	10022	820	5	1	1	1	7196	41	148	{ 75 4}	544_8hr +201_4hr
10_LHRM.df.44.mh	10105	820	5	1	30	2	7196	44	148		538_8hr +206_4hr
11_LOCA.00.tc	11001	1820	5	3	1	1	5497	0	121	100 100	1783
11_LOCA.44.mll	11070	1820	5	3	10	1	5497	44	121	100 50	1705
12_OMAA.tc	12001	1502	5	2	1	1	5497	00	121	100 100	1494 (1251 nsn=4)
12_OMAA.mll	12014	1502	5	2	10	1	5497	00	121	50 50	1483
13_OMSA.41.tc	13001	1502	5	2	1	1	5497	41	121	100 25	1443 (AC 2 or 3)
13_OMSA.44.mll	13048	1502	5	2	10	1	5497	44	121	50 50	1419
14_OMSF.41.cr	14001	1502	5	2	2	2	5497	41	121	100 25	1441
14_OMSF.41.pt	14002	1502	5	2	3	2	8291	41	121	100 1	1293
14_OMSF.44.mh	14044	1502	5	2	30	2	5497	44	121	50 50	1309
15_OMSW.41.low	15001	1502	5	2	12	3	5497	41	121	25 25	1248 to 1412
15_O10W.44.mh	15064	404	10	2	30	3	5497	44	121	25 25	261 to 387
16_OMSU.41.mh	16001	1502	5	2	21	4	5497	41	121	50 50	1433
16_O10U.44.mh	16032	404	10	2	30	4	5497	44	121	50 50	397
17_OMSH.41.low	17001	1502	5	2	12	5	5497	41	122	25 25	1238 to 1412
17_O10H.44.low	17032	404	10	2	15	5	5497	44	122	25 25	364 to 395
18_OMMA.01.tc	18001	404	10	2	1	1	5497	01	121	100 25	385
18_OMMA.16.mh	18160	404	10	2	30	1	5497	44	121	50 50	391
19_OMMF.01.cr	19001	404	10	2	2	2	5497	01	121	100 25	384
19_OMMF.01.pt	19002	404	10	2	3	2	8291	1	121	75 1	374
19_OMMF.16.mh	19160	404	10	2	30	2	5497	44	121	50 50	392
20_OSAT.41.tc	20001	404	10	2	1	1	5497	41	138	25 {25}	388
20_OSAT.44.mh	20040	404	10	2	30	1	5497	44	138	50 {50}	316
21_OSFT.41.cr	21001	404	10	2	2	2	5497	41	138	25 {25}	388
21_OSFT.41.pt	21002	404	10	2	3	2	8291	41	138	1 { 1}	388
21_OSFT.44.mh	21040	404	10	2	30	2	5497	44	138	50 {50}	316
22_OSUT.44.mh	22016	404	10	2	30	4	5497	44	138	50 {50}	
23_OSHT.44.low	23016	404	10	2	15	5	5497	44	139	20 {20}	
24_OHRM.aa.tc	24001	404	10	2	1	1	5497	0	140	100 100	296_dn +33_dy
24_OHRM.af.mh	24020	404	10	2	30	2	5497	0	140	75 75	283_dn +29_dy
24_OHRM.da.41.tc*	24021	404	10	2	1	1	5497	41	148	75 6	142_8hr +223_4hr
24_OHRM.df.41.pt	24062	404	10	2	3	2	8291	41	148	100 6	72_8hr +259_4hr
24_OHRM.df.44.mh	24100	404	10	2	30	2	5497	44	148	75 6	91_8hr +214_4hr
24_OHRM.dh.44.low	24116	404	10	2	15	5	5497	44	149	50 6	26_8hr +188_4hr
25_OSMA.41.tc	25001	404	10	2	1	1	5297	41	226	25 {25}	279_dn, 330_dy
36_OSMU.44.Hi	36004	404	10	2	30	4	5297	44	226	25 {25}	256
40_OSMH.44.Cb	40004	404	10	2	15	5	5297	44	227	20 {20}	193
41_OMYD.01.tc	41001	404	10	2	1	0	5497	01	162	1 -9	283_dy
52_OMYD.12.Hi	52011	404	10	2	30	0	5497	12	162	20 15	226
FC_FileName	Dgrp	NBoxs	G	lo	Ty	p	yr	sn	fmt	{min vx}	Num_Boxes_Filled

* 10_LHRM diurnal additional criterion: Boxes were blanked that had mostly day obs (NStB <0 in FC_01).
24_OHRM diurnal additional criterion: Not blanked if N6/N3 ≥ 6 but Nobs in each i3-hrly time ≥ 150.

Table 10. Global, Annual Average Cloud-Type Amounts and Heights from Surface Observations.

(The amounts of all the cloud types add up to more than the total cloud amount because of overlap. The amounts of the low cloud types plus the non-overlapped amounts of the middle and high cloud types add up to the total cloud amount. Base height is given in meters above the surface. Land data are averaged over the years 1971-96; ocean data are for 1954-97.)

	amount (%)		***frequency (%)***		***AWP (%)***		***Base height***	
Cloud type	*Land*	*Ocean*	*Land*	*Ocean*	*Land*	*Ocean*	*Land*	*Ocean*
Sky-obscured by fog (Fo)	1	2	1	2	100	100	0	0
Stratus (St)	5	12	6	14	72	84	500	400
Stratocumulus (Sc)	12	22	21	31	56	72	1000	600
Cumulus (Cu)	5	13	14	33	34	40	1100	600
Cumulonimbus (Cb)	4	6	7	11	59	58	1000	500
							Non-overlapped Amount	
Nimbostratus (Ns)	5	5	5	5	98	99	2	1
Altostratus (As)	4	6	5	10	82	59	3	2
Altocumulus (Ac)	17	17	32	37	52	47	11	7
High (Hi)	22	12	45	34	49	35	12	3
Total cloud cover*	***54***	***69***						
Clear sky frequency			21	3				
Precipitation frequency			9	10				

* See Figure 4 for a global map of total cloud cover.

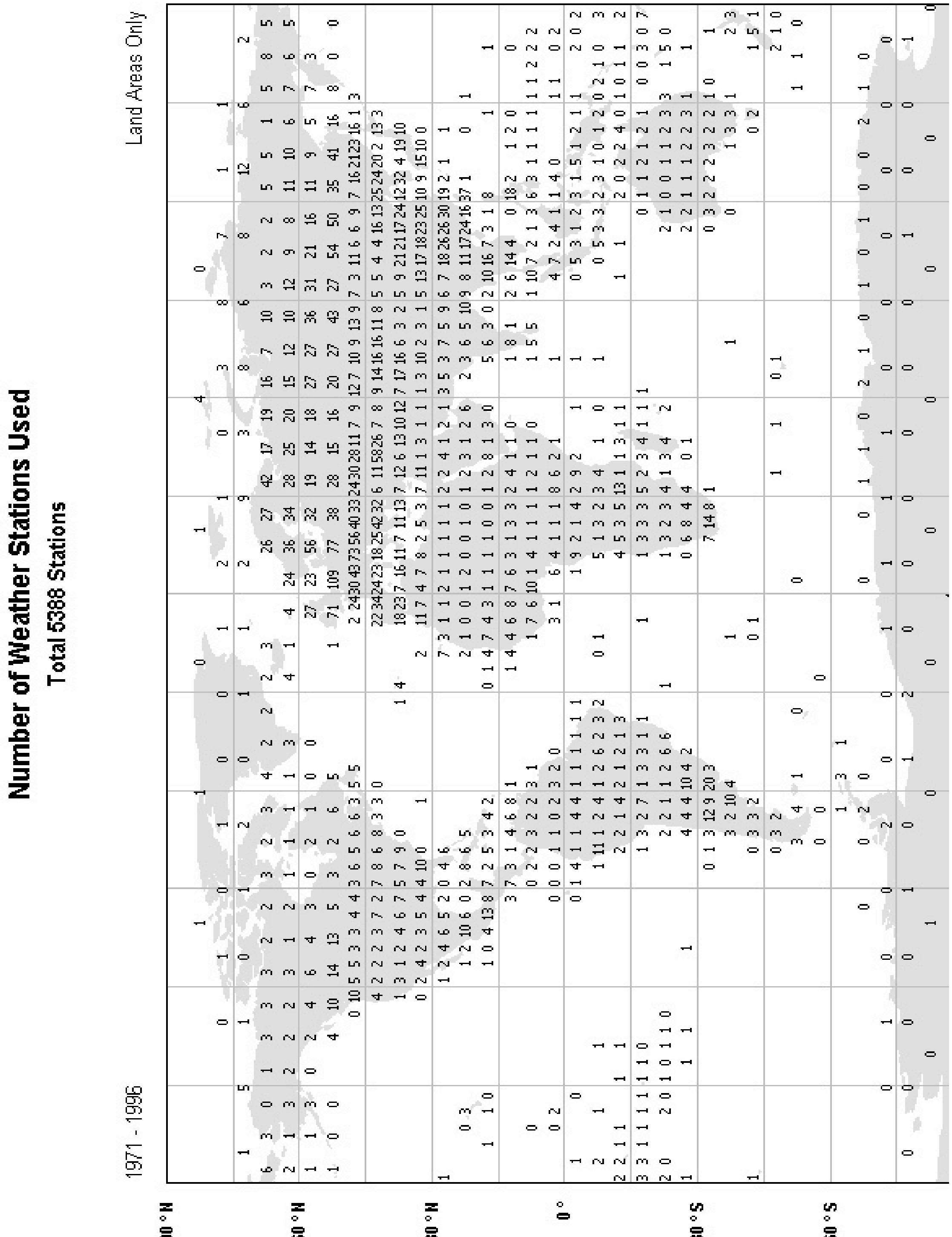


Figure 1. Number of land stations used in 5c grid boxes.
(from http://www.atmos.washington.edu/CloudMap)

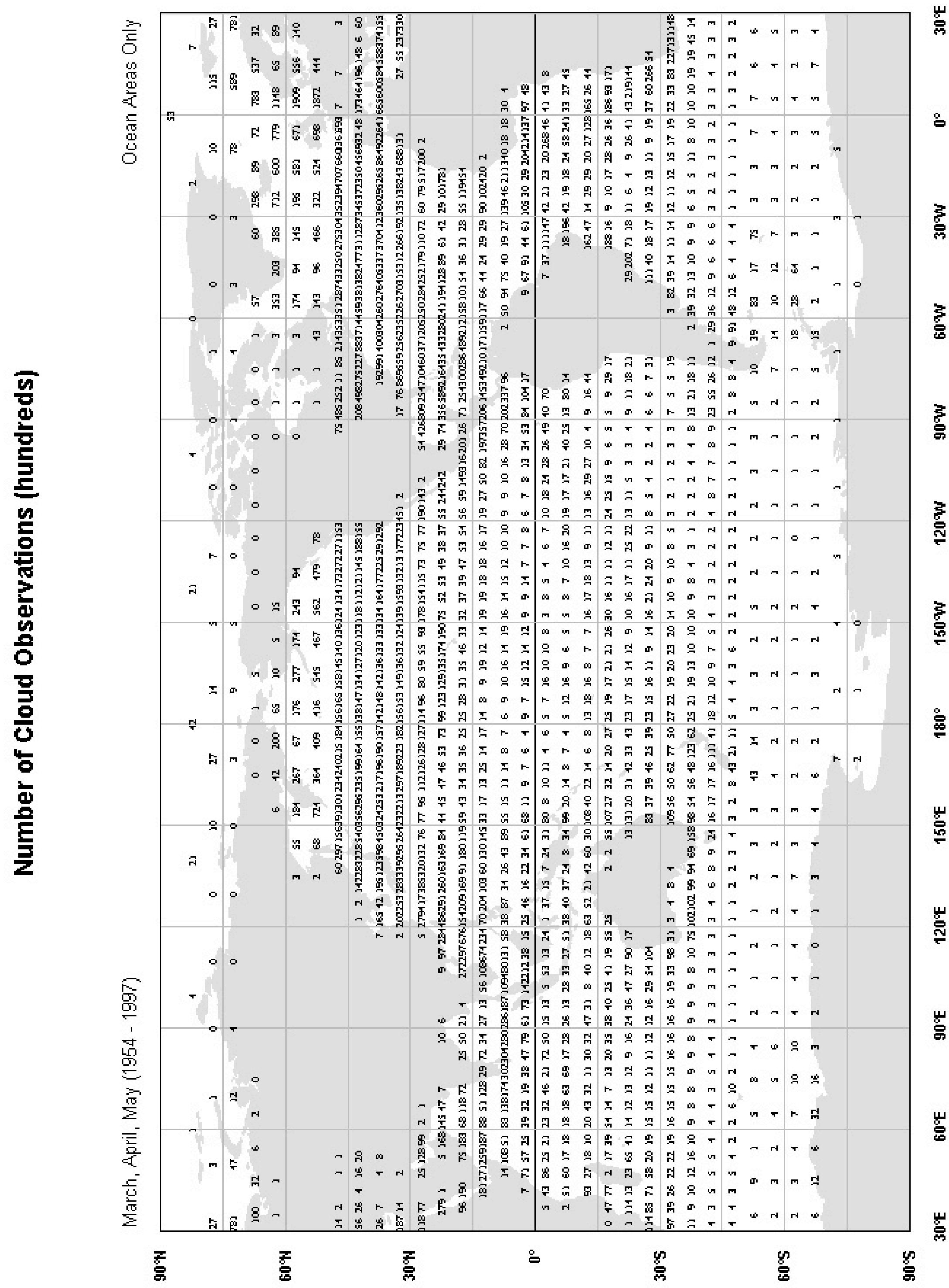


Figure 2. Number of cloud reports (hundreds) in ocean grid boxes for MAM 1954-97. (from http://www.atmos.washington.edu/CloudMap)

Figure 3a. Number of cloud reports per year used in global ocean cloud analysis for MAM.

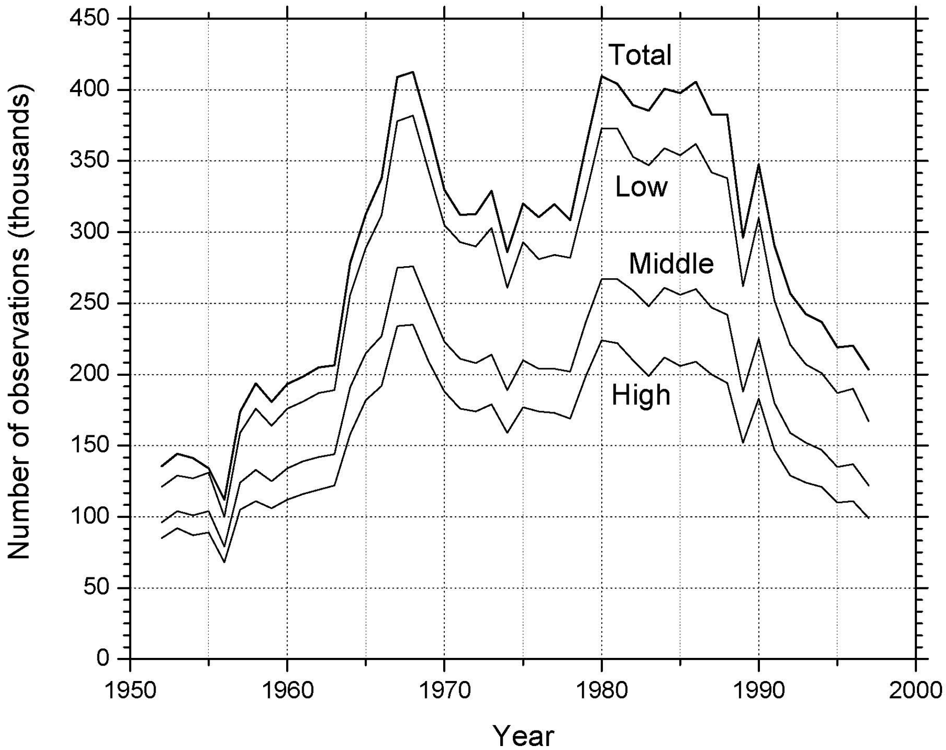
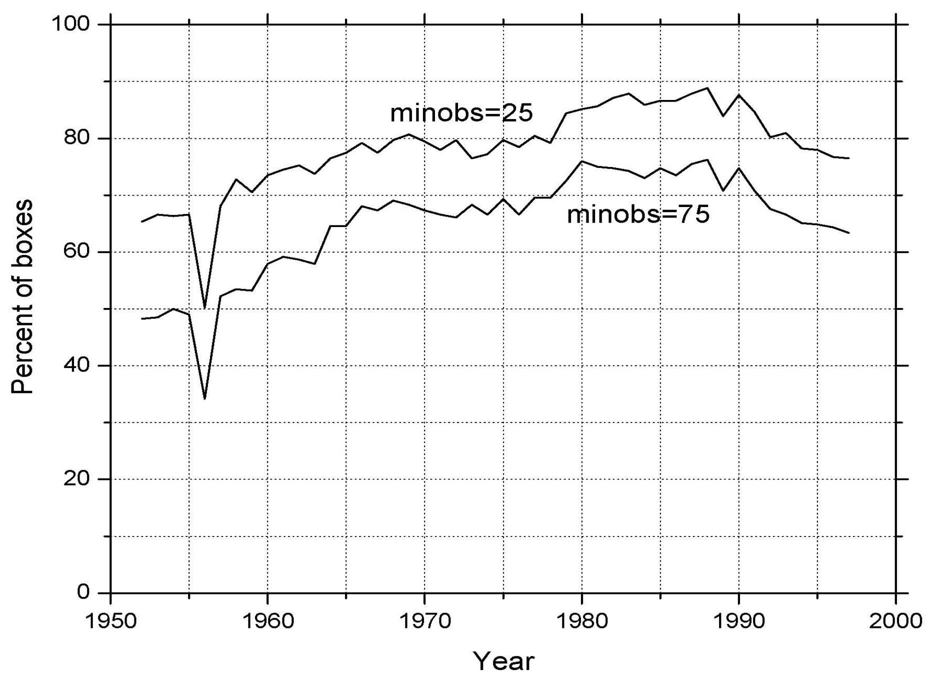


Figure 3b. Percent of possible 10r grid boxes filled in MAM (total number of ocean boxes is 404).



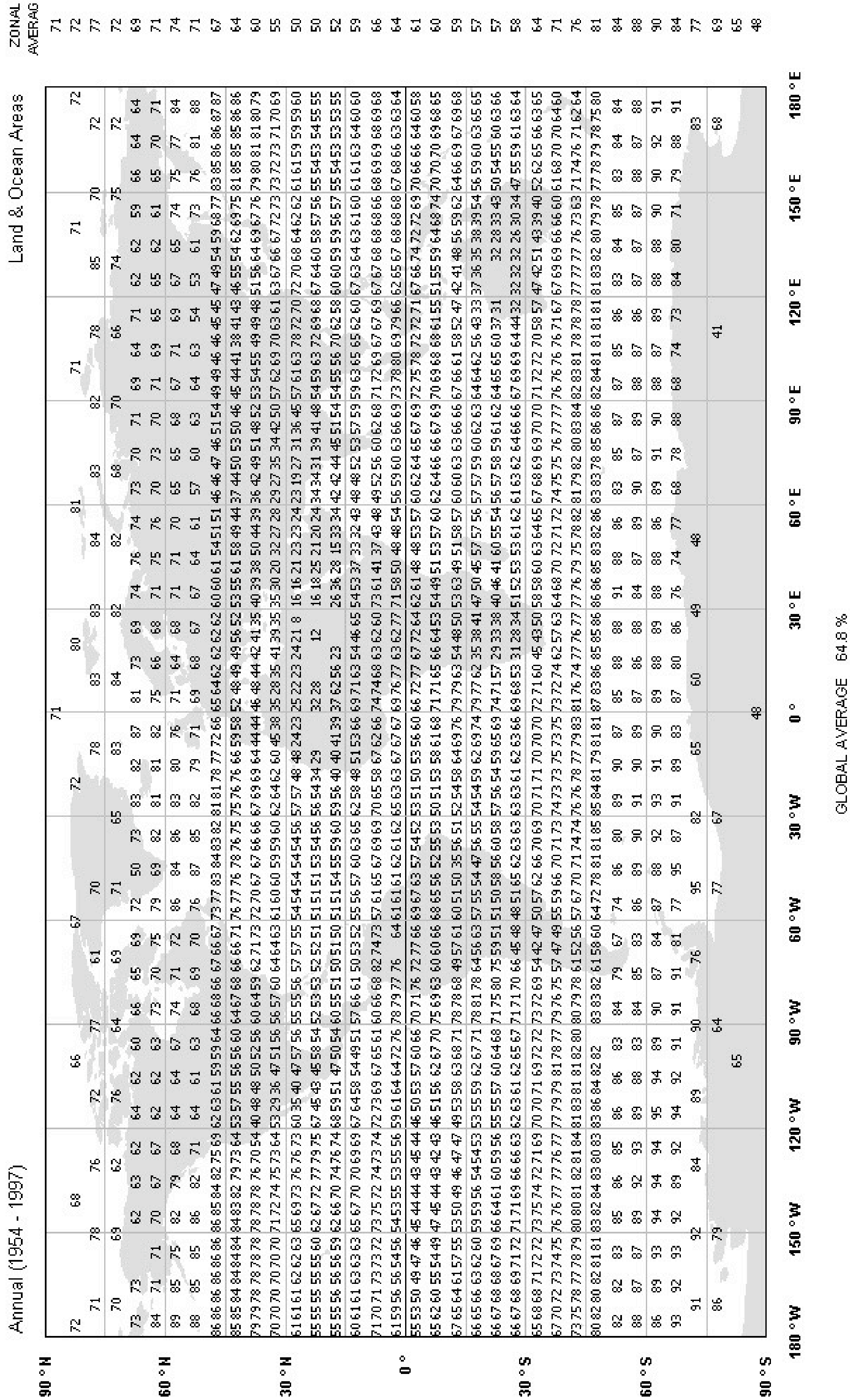


Figure 4. Annual average total cloud cover on the 5c grid.
(AvgDN from 11_LOCA, header record:11001 1820 5 3 1 1 5497 0 121 100 100)

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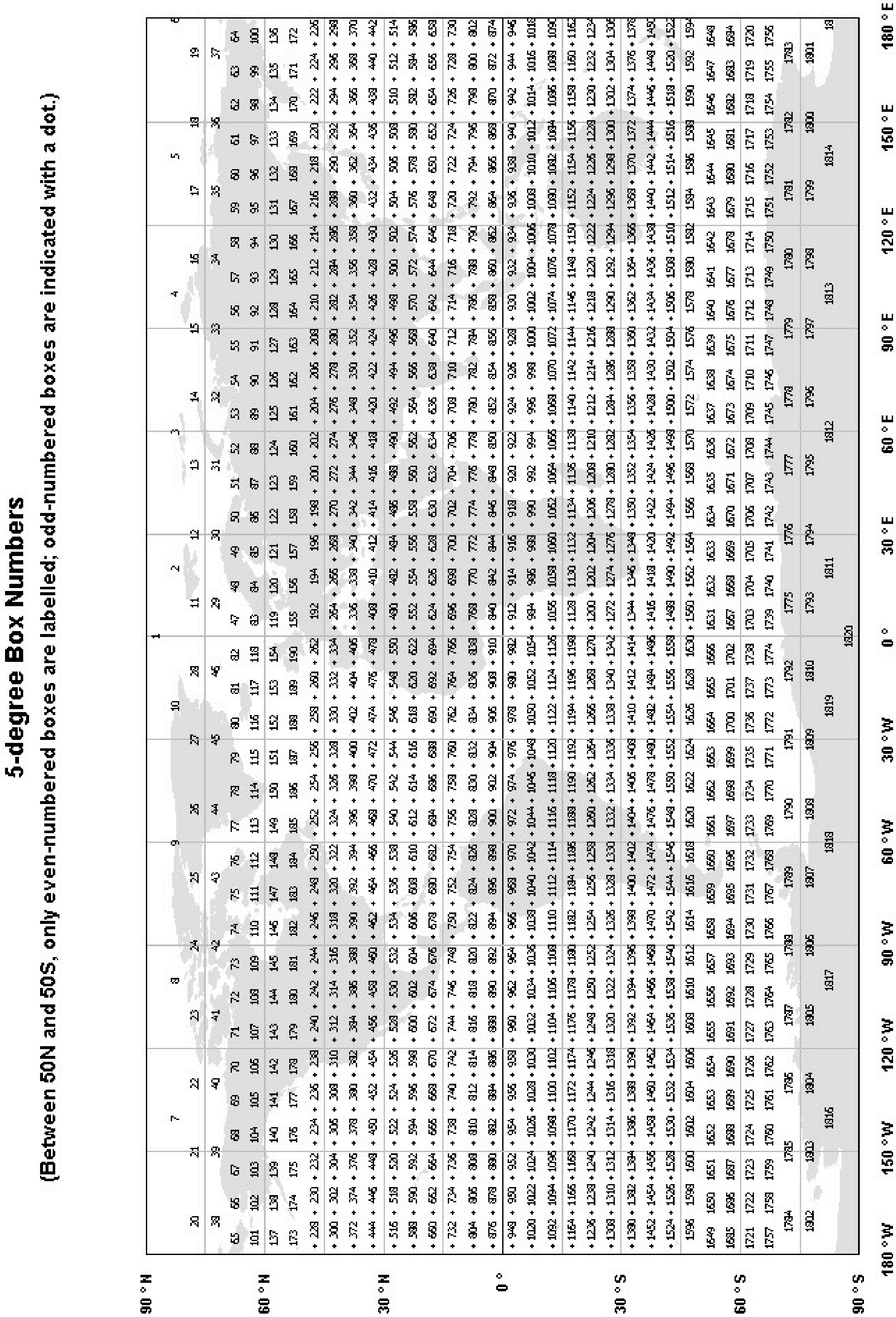
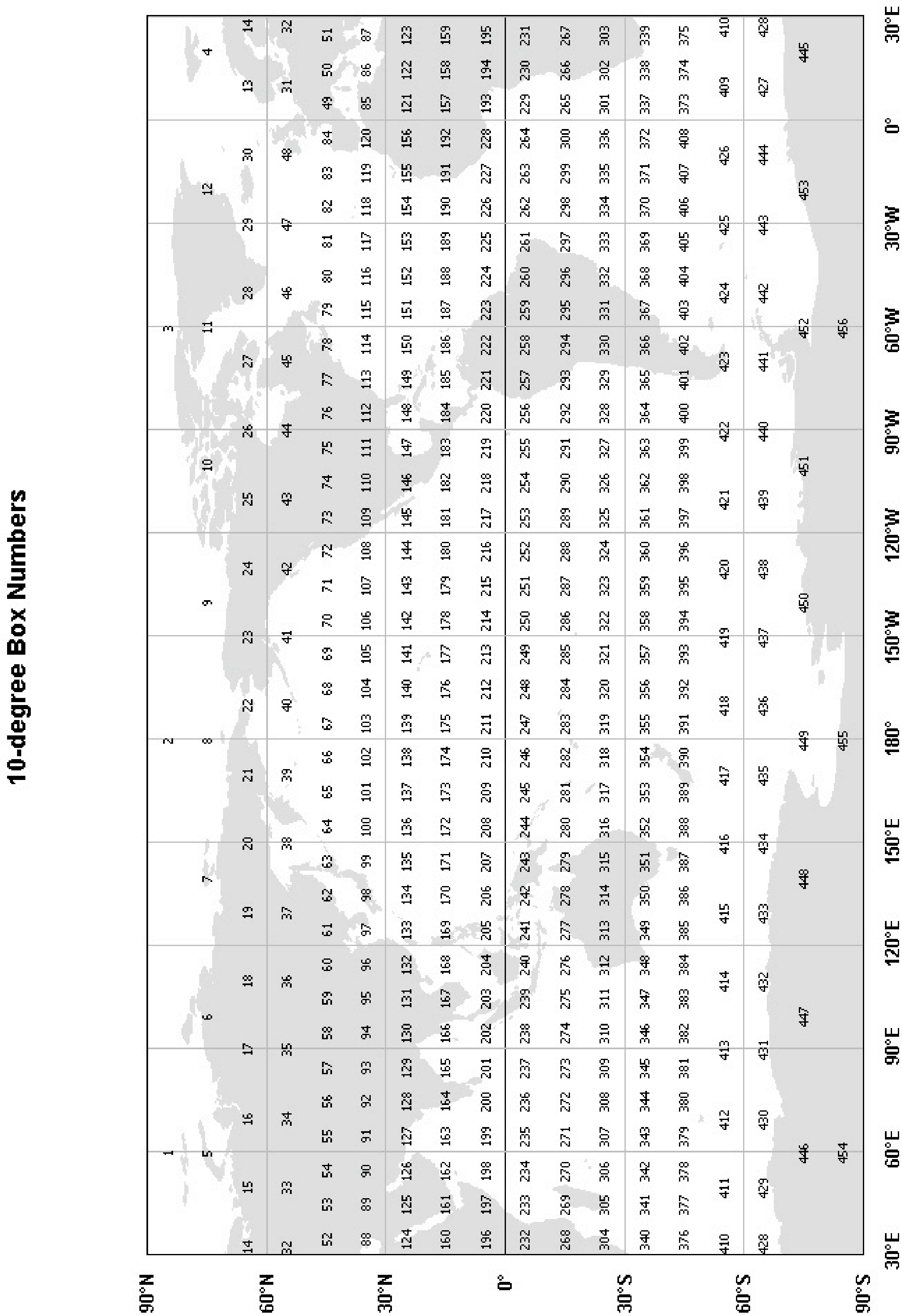
APPENDIX



Appendix A1. Box Numbers on the 5c Grid.



Appendix A2. Box Numbers on the 10r Grid.

APPENDIX B1. Conversion of 5c Box Number to Latitude,Longitude

```
      SUBROUTINE LALO5CR(KB, CLAT,CLON,KZ)
C Fortran Subprogram to
C GIVE CENTER LAT, LON and 5-Degree ZONE Numbers for BOX 5c Numbers
C-VARIABLES-
C KB    5c Box Number (1-1820)
C CLAT  Box Center Latitude (90 to -90)
C CLON  Box Center Longitude (0 to 360)
C KZ    5-deg Zone Number (1 to 36, North to South)
c
      KZ= CLAT= CLON= 0
      if (kb.le.0) return
      IF (KB.EQ.1)  THEN                                          85-90N
        KZ = 1
      ELSE IF (KB.LE.10)  THEN                                    80-85N
        KZ = 2
        CLON= 20. + 40.*MOD(KB-2,9)
      ELSE IF (KB.LE.46)  THEN                                    70-80N
        KZ = (KB-11)/18 + 3
        CLON= 10. + 20.*MOD(KB-11,18)
      ELSE IF (KB.LE.190)  THEN                                   50-70N
        KZ = (KB-47)/36 + 5
        CLON=  5. + 10.*MOD(KB-47,36)
      ELSE IF (KB.LE.1630)  THEN                                  50N-50S
        KZ = (KB-191)/72 + 9
        CLON= 2.5 + 5.*MOD(KB-191,72)
      ELSE IF (KB.LE.1774)  THEN                                  50-70S
        KZ = (KB-1631)/36 + 29
        CLON=  5. + 10.*MOD(KB-1631,36)
      ELSE IF (KB.LE.1810)  THEN                                  70-80S
        KZ = (KB-1775)/18 + 33
        CLON= 10. + 20.*MOD(KB-1775,18)
      ELSE IF (KB.LE.1819)  THEN                                  80-85S
        KZ = 35
        CLON= 20. + 40.*MOD(KB-1811,9)
      ELSE                                                        85-90S
        KZ = 36
      END IF
      CLAT= 90. - KZ*5. + 2.5
      RETURN
      END
```

APPENDIX B2. Conversion of 10r Box Number to Latitude,Longitude

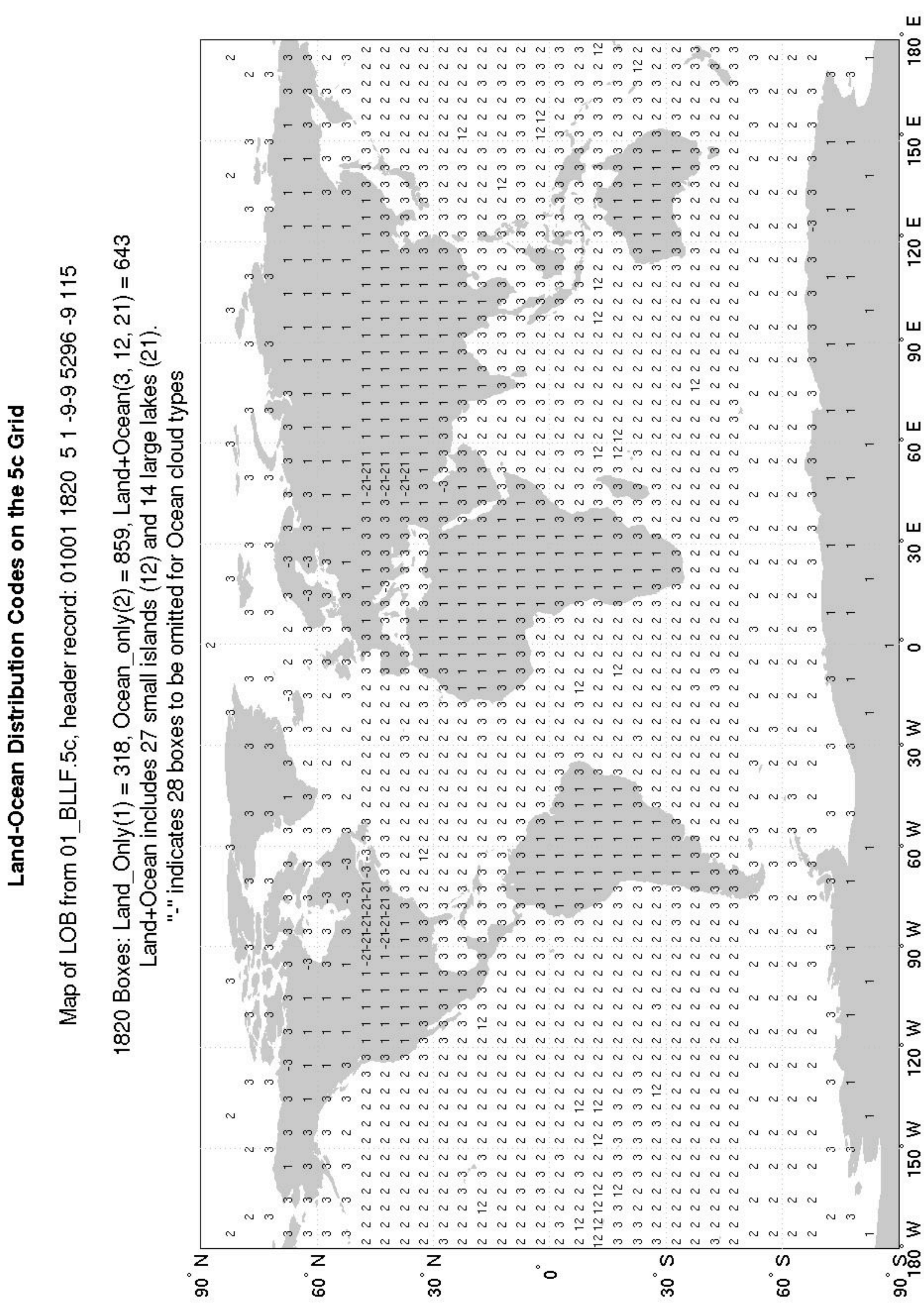
```
      SUBROUTINE LALO10R(NBB, CLAT,CLON,LZ)
C Fortran Subprogram to
C GIVE CENTER LAT, LON and 10-Degree ZONE Numbers for BOX 10r Numbers
C-VARIABLES-
C KB    10r Box Number (1-1456)
C CLAT  Box Center Latitude (90 to -90)
C CLON  Box Center Longitude (0 to 360)
C KZ    10-deg Zone Number (1 to 18, North to South)
c
      LZ= CLAT= CLON= 0
      if (NBB.le.0) return
      IF (NBB.LE.3)  THEN                                         80-90N
        LZ = 1
        CLON= 120.*MOD(NBB-1,3) + 60.
      ELSE IF (NBB.LE.12)  THEN                                   70-80N
        LZ = 2
        CLON= 40.*MOD(NBB-4,9) + 20.
      ELSE IF (NBB.LE.48)  THEN                                   50-70N
        LZ = (NBB-13)/18 + 3
        CLON= 20.*MOD(NBB-13,18) + 10.
      ELSE IF (NBB.LE.408)  THEN                                  50N-50S
        LZ = (NBB-49)/36 + 5
        CLON= 10.*MOD(NBB-49,36) + 5.
      ELSE IF (NBB.LE.444)  THEN                                  50-70S
        LZ = (NBB-409)/18 + 15
        CLON= 20.*MOD(NBB-409,18) + 10.
      ELSE IF (NBB.LE.453)  THEN                                  70-80S
        LZ = 17
        CLON= 40.*MOD(NBB-445,9) + 20.
      ELSE                                                        80-90S
        LZ = 18
        CLON= 120.*MOD(NBB-454,3) + 60.
      END IF
      CLAT= 90. - LZ*10. + 5.
      RETURN
      END
```

APPENDIX B3. Conversion of Latitude,Longitude to 5c Box Number

```
      FUNCTION LLTO5C(FLAT,ELON)
C Fortran Subprogram to
C CONVERT LATITUDE,LONGITUDE to 1820 5c BOX NUMBERS;
C-VARIABLES-
C FLAT  LATITUDE (90N to -90)
C ELON  LONGITUDE (0 to 360E)
C KB    5x5 DEG BOX NUMBERS (1-2594)
C JB    5x5c BOX NUMBERS (1-1820)
c
      LAT = (90. + FLAT)*10. + .000001
      LON = ELON*10. + .000001
      IF (LON.EQ.3600) LON=0
      LLTO5CR=0
      IF (LAT.GT.1800 .OR. LAT.LT.0) RETURN
      IF (LON.GT.3600 .OR. LON.LT.0) RETURN
C FIRST CONVERT LAT,LON TO 5x5 DEG BOX NUMBERS
C  LOWER AND LEFT BOX BORDERS ARE INCLUDED IN BOX
      KB = ((36-(LAT/50))-1)*72 + LON/50 + 2
      IF (LAT.EQ.1800) KB=1
      IF (LAT.EQ.0)  KB=2594
C CONVERT 5x5 DEG NUMBERS TO 5x5c BOX NUMBERS
      IF (KB.GE.578 .AND. KB.LE.2017)  THEN                        50N-50S
        JB = KB-387
      ELSE IF (KB.GE.290 .AND. KB.LE.2305)  THEN                   50-70
        JB = (KB-290)/72 *36 + MOD(KB-290,72)/2 + 47
        IF (KB.GE.2018)  JB= JB+720
      ELSE IF (KB.GE.146 .AND. KB.LE.2449)  THEN                   70-80
        JB = (KB-146)/72 *18 + MOD(KB-146,72)/4 + 11
        IF (KB.GE.2306)  JB= JB+1224
      ELSE IF (KB.GE.74  .AND. KB.LE.2521)  THEN                   80-85
        JB = MOD(KB-74,72)/8 + 2
        IF (KB.GE.2450)  JB= JB+1809
      ELSE
        JB = 1                                                     85-90N
        IF (KB.GE.2522)  JB= 1820                                  85-90S
      END IF
      LLTO5CR = JB
     RETURN
    END
```

APPENDIX B4. Conversion of Latitude,Longitude to 10r Box Number

```
      FUNCTION LLTO10R(FLAT,ELON)
C Fortran Subprogram to
C CONVERT LAT,LON to 10r BOX NUMBERS.
C-VARIABLES-
C FLAT  LATITUDE (90 TO -90)
C ELON  LONGITUDE (0 TO 360)
C KB    10x10 DEG BOX NUMBERS (1-648)
C JB    10x10r BOX NUMBERS (1-456)
c
      LAT = (90. + FLAT)*10. + .000001
      LON = ELON*10. + .000001
      IF (LON.EQ.3600) LON=0
      LLTO10R=0
      IF (LAT.GT.1800 .OR. LAT.LT.0) RETURN
      IF (LON.GT.3600 .OR. LON.LT.0) RETURN
C FIRST CONVERT LAT,LON TO 10X10 DEG BOX NUMBERS
C  LOWER AND LEFT BOX BOARDERS ARE INCLUDED IN BOX
      KB = ((18-(LAT/100))-1)*36 + LON/100 + 1
      IF (LAT.EQ.1800) KB=19
      IF (LAT.EQ.0000) KB=631
C CONVERT 10x10 DEG NUMBERS to 10x10r BOX NUMBERS
      IF (KB.GE.145 .AND. KB.LE.504)  THEN                         50N-50S
        JB = KB-96
      ELSE IF (KB.GE.73 .AND. KB.LE.576)  THEN                     50-70
        JB = (KB-73)/36 *18 + MOD(KB-73,36)/2 + 13
        IF (KB.GE.505)  JB= JB+180
      ELSE IF (KB.GE.37 .AND. KB.LE.612)  THEN                     70-80
        JB = MOD(KB-37,36)/4  + 4
        IF (KB.GE.577)  JB= JB+441
      ELSE if (KB.GE.1 .AND. KB.LE.648)  then
        JB = MOD(KB-1,36)/12 + 1                                   85-90N
        IF (KB.GE.613)  JB= JB+453                                 85-90S
      END IF
      LLTO10R = JB
     RETURN
    END
```



Appendix C. Land-Ocean Distribution Codes on the 5c Grid.

APPENDIX D

Grid-box numbers (5c) in China where AWP of As and Ac is not valid for 1971-79#,

and

Grid-box numbers in Indonesia where bogus values for AWP of Ns, As, Ac & Hi are used.*

```
                 90E                            120E                           150E
50N ______________|_____________________________|_____________________________|____________________
         207  208 | 209                     214 | 215  216                    |
    278  279  280 | 281  282  283  284  285  286 | 287  288                    |
    359  351  352 | 353  354  355  356  357  358 | 359                         |
    422  423  424 | 425  426  427  428  429  430 | 431                         |
30N ______________|_____________________________|_____________________________|____________________
                  |      498  499  500  501  502 | 503                         |
                  |______570__571__ 572  573  574 |                             |
                  |      642  643| 644  645      |                             |
15N ______________|______________|______________|_____________________________|____________________
                  |      714  715                |               722  723      |
                  |      786  787       789  790 |          793  794  795  796 | 797 798 799 800 801
                  |      858  859  860  861      | 863  864                    | 869 870
 00 ______________|_____________________________|_____________________________|____________________
                  |           931  932  933  934 | 935  936  937  938  939  940 | 941
                  |               1004 1005 1006 |1007 1008 1009      1011      |
                  |                              |                             |
15N ______________|_____________________________|_____________________________|____________________
```

Box-mean values from 1980-89 were used for these 50 boxes for 1971-97.

** For the 47 boxes listed here and for boxes 827 & 899 in South America (0-10N, 55-60W), we used AWP values of: Ns=98%, As=80%, Ac=51%, Hi=46%.*

APPENDIX E1.
Land Stations and Grid Boxes Found to Contain Erroneous Data

Note: Most of these problem stations were discovered while analyzing for trends. Sometimes increasing mins removes the trend problem, but long-term mean values may still be questionable. Problems often appear more clearly for one type but also affect other types. This presentation affords a general caution for using or interpreting any data.

DEW STATIONS

Station WMO ID	Location	N_LAT	E_LON	Years*	B5c	NStB
	ALASKA					
70030	Wainwright	70.62	200.15	1971-88	39	5
70045	Lonely	70.92	206.77	1971-88	39	5
70063	Oliktok Pt	70.50	210.12	1971-88	39	5
70121	Point Lay	69.73	196.98	1971-88	66	3
	CANADA					
71053	Clinton Point	69.58	239.20	1971-93	70	3
71080	Mackar Inlet	68.30	274.32	1971-91	74	3
71082	Albert	82.50	297.67	1972-91	9	1
71091	Longstaff Bluff	68.95	284.70	1971-90	75	2
71092	Dewar Lakes	68.65	288.77	1971-93	75	2
71093	Cape Hooper	68.43	293.22	1971-89	76	3
71096	Broughton Is.	67.55	296.22	1971-89	76	3
71919	Pelly Bay	68.43	270.40	1971-91	74	3
71927	Gladman Point	68.67	262.20	1971-91	73	2
71929	Byron Bay	68.75	250.93	1971-85	72	2
71937	Lady Franklin Pt	68.48	246.78	1973-93	71	3
71956	Nicholson Pen.	69.93	231.03	1974-93	70	3
71959	Tuktoyaktuk	69.45	227.00	1971-93	69	3
71968	Shingle Point	68.93	222.77	1974-93	69	3
71969	Konakuk Beach	69.60	219.83	1974-92	68	1
	DEW Stations bad at night:					
71911	Shepherd Bay	68.80	266.58	1974-93	73	2
71939	Cape Young	68.93	243.08	1974-93	71	3

* Bad data appeared for these stations after 1985.

Other Stations found with bad data:

Station WMO ID	Location	Notes on problems seen	B5c	NStB
76151	Guadalupe Is.	St ht trend, too few yrs	527	1
38836	USSR	Cb ht & other, too few obs	348	17
38687	USSR	Cb ht & other	347	7

Stations with curious reports *(CAUTION)*

Station WMO ID	Location	Notes on problems seen	B5c	NStB
23975	Siberia	change Cb reporting 1985	91	10
29654	Siberia	Ns trend strange	127	36
65502	Africa	Hi fq near 100% (CH=2)	766	8
80447	Venezuela	Ac becomes As in time (CM=7 -> CM=2)	824	3
82668	Brazil	Fog very frequent; few yrs (OK in river valley?)	1044	-2
84370	Peru	St h=4; too few obs	966	4
94333	Australia	base heights	1226	1

APPENDIX E2.

Ocean Grid Boxes Found to Contain Erroneous Data

BOXES NOT TO BE USED FOR OCEAN CLOUD TYPES, due to a Large "Bias Fraction" (Sec. 4.4.3)

B5c Num	Location	N_LAT	E_LON	FRL
81	Greenland	67.5	345.0	0.1678
	Gulf of Bothnia			
49	"	67.5	25.0	0.9636
84	"	62.5	15.0	0.8617
85	"	62.5	25.0	0.8424
	Hudson Bay			
70	"	67.5	235.0	0.9669
109	"	62.5	265.0	0.8007
147	"	57.5	285.0	0.7947
183	"	52.5	285.0	0.9561
	Great Lakes			
184	"	52.5	295.0	0.9801
244	"	47.5	267.5	1.0000
245	"	47.5	272.5	1.0000
246	"	47.5	277.5	1.0000
247	"	47.5	282.5	1.0000
248	"	47.5	287.5	1.0000
249	"	47.5	292.5	0.9015
250	"	47.5	297.5	0.4157
317	"	42.5	272.5	1.0000
318	"	42.5	277.5	1.0000
319	"	42.5	282.5	1.0000
	Caspian Sea			
200	"	47.5	47.5	1.0000
201	"	47.5	57.5	1.0000
272	"	42.5	47.5	1.0000
273	"	42.5	52.5	1.0000
344	"	37.5	47.5	1.0000
345	"	37.5	52.5	1.0000
266	Adriatic Sea	42.5	17.5	0.6877
488	Persian Gulf	27.5	47.5	0.8550
1751	Antarctic Coast	-67.5	125.0	0.6566

Other Boxes found with bad data:

Box Num	Location	Notes on problems seen	Bad clouds
4	N Coast Siberia	fq_Hi large; stationary ship reports CH=1, CL=0	MAM & DJF
40, 69	Beaufort Sea	fq_Hi low; few years of data often Nh=N	Blanked
98	Sea of Okhotsk	awp_As low; ship in bay reports Nh=N	Upper Types
728	mid-Pacific Is.	awp_Cf large; ship sits at Bikini Atoll 1954, 56, 58 giving often same report	MAM
1758	near Antarctica	fq_Cb large; mostly 1954 data from Deck 187 (Japanese Whaling) [adjacent boxes 1757, 1722 affected some for DJF] {other nearby ships code as Ns}	MAM

Boxes with curious reports *(CAUTION)*

Box Num	Location	Notes on problems seen	Bad clouds
B5c 47	Norwegian Sea	fq_Cb large;	?
1701	S. Atlantic	ht_Cu high; in 1959 h=9 from Deck 898 (Japanese)	?
B10r 6	N Coast Siberia	fq_Cr high at night in March only 56 obs; lower for MAM	check Nobs

APPENDIX F. GRIDDED CLOUD ARCHIVE FILE NAMES, NDP-026E

1625 DGRPs in 708 files in 52 File Categories

```
{parameters: a=amt, f=fq, w=awp, u=nol, h=ht}
   bytes datewritten  File_Name      DGRPs
-------- -----------  -------------  --------
[01_BLLF]  Grid-Box Data B5c,B10r fmt_115:
   56453 Jun  6 2002  01_BLLF.5c     01001
   14169 Aug 19 2002  01_BLLF.10r    01002

[02_LMAA]  La MY-ANNUAL Avg  B5c fmt_121:
   38573 Jul 11 2002  02_LMAA.tc     02001
   38573 Jul 12 2002  02_LMAA.cr     02002
   38573 Aug 13 2002  02_LMAA.pt     02003
  192865 Jul 12 2002  02_LMAA.low    02004-8
  154292 Jul 12 2002  02_LMAA.mh     02008-12
   77146 Jul 31 2002  02_LMAA.mll    02013-14

[03_LMSA]  La MY-SEASONAL Amt  B5c fmt_121:
   38573 Jun 10 2002  03_LMSA.41.tc  03001
  192865 Jun 11 2002  03_LMSA.41.low 03002-6
  154292 Jun 11 2002  03_LMSA.41.mh  03007-10
   77146 Jun 13 2002  03_LMSA.41.mll 03011-12
   38573 Jun 12 2002  03_LMSA.42.tc  03013
  192865 Jun 12 2002  03_LMSA.42.low 03014-18
  154292 Jun 12 2002  03_LMSA.42.mh  02019-22
   77146 Jun 13 2002  03_LMSA.42.mll 03023-24
   38573 Jun 12 2002  03_LMSA.43.tc  03025
  192865 Jun 12 2002  03_LMSA.43.low 03026-30
  154292 Jun 12 2002  03_LMSA.43.mh  03031-34
   77146 Jun 13 2002  03_LMSA.43.mll 03035-36
   38573 Jun 12 2002  03_LMSA.44.tc  03037
  192865 Jun 12 2002  03_LMSA.44.low 03038-42
  154292 Jun 12 2002  03_LMSA.44.mh  03043-46
   77146 Jun 13 2002  03_LMSA.44.mll 03047-48

[04_LMSF]  La MY-SEASONAL Fq  B5c fmt_121:
   38573 Jun 25 2002  04_LMSF.41.cr  04001
   38573 Aug  9 2002  04_LMSF.41.pt  04002
  192865 Jun 26 2002  04_LMSF.41.low 04003-7
  154292 Jun 26 2002  04_LMSF.41.mh  04008-11
   38573 Jun 25 2002  04_LMSF.42.cr  04012
   38573 Aug  9 2002  04_LMSF.42.pt  04013
  192865 Jun 26 2002  04_LMSF.42.low 04014-18
  154292 Jun 26 2002  04_LMSF.42.mh  04019-22
   38573 Jun 25 2002  04_LMSF.43.cr  04023
   38573 Aug  9 2002  04_LMSF.43.pt  04024
  192865 Jun 26 2002  04_LMSF.43.low 04025-29
  154292 Jun 26 2002  04_LMSF.43.mh  04030-33
   38573 Jun 25 2002  04_LMSF.44.cr  04034
   38573 Aug  9 2002  04_LMSF.44.pt  04035
  192865 Jun 26 2002  04_LMSF.44.low 04036-40
  154292 Jun 26 2002  04_LMSF.44.mh  04041-44

[05_LMSW]  La MY-SEASONAL AWP  B5c fmt_121:
  154292 Jun 26 2002  05_LMSW.41.low 05001-4
  154292 Jun 26 2002  05_LMSW.41.mh  05005-8
  154292 Jun 27 2002  05_LMSW.42.low 05009-12
  154292 Jun 27 2002  05_LMSW.42.mh  05013-16
  154292 Jun 27 2002  05_LMSW.43.low 05017-20
  154292 Jun 27 2002  05_LMSW.43.mh  05021-24
  154292 Jun 27 2002  05_LMSW.44.low 05025-28
  154292 Jun 27 2002  05_LMSW.44.mh  05029-32

[06_LMSU]  La MY-SEASONAL NOL  B5c fmt_121:
  154292 Jun 27 2002  06_LMSU.41.mh  06001-4
  154292 Jun 27 2002  06_LMSU.42.mh  06005-8
  154292 Jun 27 2002  06_LMSU.43.mh  06009-12
  154292 Jun 27 2002  06_LMSU.44.mh  06013-16

[07_LMSH]  La MY-SEASONAL Ht  B5c fmt_122:
  154292 Jun 28 2002  07_LMSH.41.low 07001-4
  154292 Jun 28 2002  07_LMSH.42.low 07005-8
  154292 Jun 28 2002  07_LMSH.43.low 07009-12
  154292 Jun 28 2002  07_LMSH.44.low 07013-16

[08_LMMA]  La MY-MONTHLY Amt  B5c fmt_121:
   38573 Jul  1 2002  08_LMMA.01.tc  08001
  192865 Jul  1 2002  08_LMMA.01.low 08002-6
  154292 Jul  1 2002  08_LMMA.01.mh  08007-10
   38573 Jul  1 2002  08_LMMA.02.tc  08011
  192865 Jul  1 2002  08_LMMA.02.low 08012-16
  154292 Jul  2 2002  08_LMMA.02.mh  08017-20
   38573 Jul  2 2002  08_LMMA.03.tc  08021
  192865 Jul  2 2002  08_LMMA.03.low 08022-26
  154292 Jul  2 2002  08_LMMA.03.mh  08027-30
   38573 Jul  2 2002  08_LMMA.04.tc  08031
  192865 Jul  2 2002  08_LMMA.04.low 08032-36
  154292 Jul  2 2002  08_LMMA.04.mh  08037-40
   38573 Jul  2 2002  08_LMMA.05.tc  08041
  192865 Jul  2 2002  08_LMMA.05.low 08042-46
  154292 Jul  2 2002  08_LMMA.05.mh  08047-50
   38573 Jul  2 2002  08_LMMA.06.tc  08051
  192865 Jul  2 2002  08_LMMA.06.low 08052-56
  154292 Jul  2 2002  08_LMMA.06.mh  08057-60
   38573 Jul  2 2002  08_LMMA.07.tc  08061
  192865 Jul  2 2002  08_LMMA.07.low 08062-66
  154292 Jul  2 2002  08_LMMA.07.mh  08067-70
   38573 Jul  2 2002  08_LMMA.08.tc  08071
  192865 Jul  2 2002  08_LMMA.08.low 08072-76
  154292 Jul  2 2002  08_LMMA.08.mh  08077-80
   38573 Jul  2 2002  08_LMMA.09.tc  08081
  192865 Jul  2 2002  08_LMMA.09.low 08082-86
  154292 Jul  3 2002  08_LMMA.09.mh  08087-90
   38573 Jul  3 2002  08_LMMA.10.tc  08091
  192865 Jul  3 2002  08_LMMA.10.low 08092-96
  154292 Jul  3 2002  08_LMMA.10.mh  08097-100
   38573 Jul  3 2002  08_LMMA.11.tc  08101
  192865 Jul  3 2002  08_LMMA.11.low 08102-106
  154292 Jul  3 2002  08_LMMA.11.mh  08107-110
   38573 Jul  3 2002  08_LMMA.12.tc  08111
  192865 Jul  3 2002  08_LMMA.12.low 08112-116
  154292 Jul  3 2002  08_LMMA.12.mh  08117-120

[09_LMMF]  La MY-MONTHLY Fq  B5c fmt_121:
   38573 Jul  3 2002  09_LMMF.01.cr  19001
   38573 Aug  9 2002  09_LMMF.01.pt  19002
  192865 Jul  5 2002  09_LMMF.01.low 19003-7
  154292 Jul  5 2002  09_LMMF.01.mh  19008-11
   38573 Jul  5 2002  09_LMMF.02.cr  19012
   38573 Aug  9 2002  09_LMMF.02.pt  19013
  192865 Jul  5 2002  09_LMMF.02.low 19014-18
  154292 Jul  5 2002  09_LMMF.02.mh  19019-22
   38573 Jul  5 2002  09_LMMF.03.cr  19023
   38573 Aug  9 2002  09_LMMF.03.pt  19024
  192865 Jul  5 2002  09_LMMF.03.low 19025-29
  154292 Jul  5 2002  09_LMMF.03.mh  19030-33
   38573 Jul  5 2002  09_LMMF.04.cr  19034
   38573 Aug  9 2002  09_LMMF.04.pt  19035
  192865 Jul  8 2002  09_LMMF.04.low 19036-40
  154292 Jul  8 2002  09_LMMF.04.mh  19041-44
   38573 Jul  8 2002  09_LMMF.05.cr  19045
   38573 Aug  9 2002  09_LMMF.05.pt  19046
  192865 Jul  8 2002  09_LMMF.05.low 19047-51
  154292 Jul  8 2002  09_LMMF.05.mh  19052-55
   38573 Jul  8 2002  09_LMMF.06.cr  19056
   38573 Aug  9 2002  09_LMMF.06.pt  19057
  192865 Jul  8 2002  09_LMMF.06.low 19058-62
  154292 Jul  8 2002  09_LMMF.06.mh  19063-66
   38573 Jul  8 2002  09_LMMF.07.cr  19067
   38573 Aug  9 2002  09_LMMF.07.pt  19068
  192865 Jul  8 2002  09_LMMF.07.low 19069-73
  154292 Jul  8 2002  09_LMMF.07.mh  19074-77
   38573 Jul  8 2002  09_LMMF.08.cr  19078
   38573 Aug  9 2002  09_LMMF.08.pt  19079
  192865 Jul  8 2002  09_LMMF.08.low 19080-84
  154292 Jul  8 2002  09_LMMF.08.mh  19085-88
   38573 Jul  8 2002  09_LMMF.09.cr  19089
   38573 Aug  9 2002  09_LMMF.09.pt  19090
  192865 Jul  8 2002  09_LMMF.09.low 19091-95
  154292 Jul  8 2002  09_LMMF.09.mh  19096-99
   38573 Jul  8 2002  09_LMMF.10.cr  19100
```

```
   38573 Aug  9 2002  09_LMMF.10.pt  19101
  192865 Jul  8 2002  09_LMMF.10.low 19102-106
  154292 Jul  8 2002  09_LMMF.10.mh  19107-110
   38573 Jul  8 2002  09_LMMF.11.cr  19111
   38573 Aug  9 2002  09_LMMF.11.pt  19112
  192865 Jul  8 2002  09_LMMF.11.low 19113-117
  154292 Jul  8 2002  09_LMMF.11.mh  19118-121
   38573 Jul  8 2002  09_LMMF.12.cr  19122
   38573 Aug  9 2002  09_LMMF.12.pt  19123
  192865 Jul  8 2002  09_LMMF.12.low 19124-128
  154292 Jul  8 2002  09_LMMF.12.mh  19129-132
```

[10_LHRM.aa] La Ann-Harmonic Amt B5c fmt_140:

```
   22173 Jul 16 2002  10_LHRM.aa.tc  10001
  110865 Jul 17 2002  10_LHRM.aa.low 10002-6
   88692 Jul 17 2002  10_LHRM.aa.mh  10007-10
```

[10_LHRM.af] La Ann-Harmonic Fq B5c fmt_140:

```
   22173 Jul 17 2002  10_LHRM.af.cr  10011
   22173 Aug 13 2002  10_LHRM.af.pt  10012
  110865 Jul 18 2002  10_LHRM.af.low 10013-17
   88692 Jul 18 2002  10_LHRM.af.mh  10018-21
```

[10_LHRM.da] La Di-Harmonic Amt B5c fmt_148:

```
   22173 Jul 25'02 10_LHRM.da.41.tc  10022
  110865 Jul 25'02 10_LHRM.da.41.low 10023-27
   88692 Jul 25'02 10_LHRM.da.41.mh  10028-31
   22173 Jul 26'02 10_LHRM.da.42.tc  10032
  110865 Jul 26'02 10_LHRM.da.42.low 10033-37
   88692 Jul 29'02 10_LHRM.da.42.mh  10038-41
   22173 Jul 26'02 10_LHRM.da.43.tc  10042
  110865 Jul 26'02 10_LHRM.da.43.low 10043-47
   88692 Jul 29'02 10_LHRM.da.43.mh  10048-51
   22173 Jul 26'02 10_LHRM.da.44.tc  10052
  110865 Jul 26'02 10_LHRM.da.44.low 10053-57
   88692 Jul 29'02 10_LHRM.da.44.mh  10058-61
```

[10_LHRM.df] La Di-Harmonic Fq B5c fmt_148:

```
   22173 Jul 29'02 10_LHRM.df.41.cr  10062
   22173 Aug 14'02 10_LHRM.df.41.pt  10063
  110865 Jul 30'02 10_LHRM.df.41.low 10064-68
   88692 Jul 30'02 10_LHRM.df.41.mh  10069-72
   22173 Jul 29'02 10_LHRM.df.42.cr  10073
   22173 Aug 14'02 10_LHRM.df.42.pt  10074
  110865 Jul 30'02 10_LHRM.df.42.low 10075-79
   88692 Jul 31'02 10_LHRM.df.42.mh  10080-83
   22173 Jul 29'02 10_LHRM.df.43.cr  10084
   22173 Aug 14'02 10_LHRM.df.43.pt  10085
  110865 Jul 30'02 10_LHRM.df.43.low 10086-90
   88692 Jul 31'02 10_LHRM.df.43.mh  10091-94
   22173 Jul 29'02 10_LHRM.df.44.cr  10095
   22173 Aug 14'02 10_LHRM.df.44.pt  10096
  110865 Jul 30'02 10_LHRM.df.44.low 10097-101
   88692 Jul 31'02 10_LHRM.df.44.mh  10102-105
---------------------------------------------
```

[11_LOCA] L+Oc MY-Avgs B5c fmt_121:

```
   85581 Sep  6 2006  11_LOCA.00.tc  11001
   85581 Sep  7 2006  11_LOCA.00.cr  11002
   85581 Mar 13 2007  11_LOCA.00.pt  11003
  427905 Sep  7 2006  11_LOCA.00.low 11004-8
  342324 Sep  7 2006  11_LOCA.00.mh  11009-12
  171162 Mar 29 2007  11_LOCA.00.mll 11013-14
   85581 Aug 15 2006  11_LOCA.41.tc  11015
   85581 Aug 15 2006  11_LOCA.41.cr  11016
   85581 Mar 13 2007  11_LOCA.41.pt  11017
  427905 Sep  8 2006  11_LOCA.41.low 11018-22
  342324 Sep  8 2006  11_LOCA.41.mh  11023-26
  171162 Mar 29 2007  11_LOCA.41.mll 11027-28
   85581 Aug 17 2006  11_LOCA.42.tc  11029
   85581 Aug 17 2006  11_LOCA.42.cr  11030
   85581 Mar 13 2007  11_LOCA.42.pt  11031
  427905 Sep 14 2006  11_LOCA.42.low 11032-36
  342324 Sep 14 2006  11_LOCA.42.mh  11037-40
  171162 Mar 29 2007  11_LOCA.42.mll 11041-42
   85581 Aug 11 2006  11_LOCA.43.tc  11043
   85581 Aug 11 2006  11_LOCA.43.cr  11044
   85581 Mar 13 2007  11_LOCA.43.pt  11045
  427905 Sep 14 2006  11_LOCA.43.low 11046-50
  342324 Sep 14 2006  11_LOCA.43.mh  11051-54
  171162 Mar 29 2007  11_LOCA.43.mll 11055-56
   85581 Aug 18 2006  11_LOCA.44.tc  11057
   85581 Aug 18 2006  11_LOCA.44.cr  11058
   85581 Mar 13 2007  11_LOCA.44.pt  11059
  427905 Sep 15 2006  11_LOCA.44.low 11060-64
  342324 Sep 15 2006  11_LOCA.44.mh  11065-68
  171162 Mar 29 2007  11_LOCA.44.mll 11069-70
---------------------------------------------
```

[12_OMAA] Oc MY-ANNUAL Avg B5c fmt_121:

```
   70635 Jun 22 2006  12_OMAA.tc     12001
   70635 Jun 22 2006  12_OMAA.cr     12002
   70635 Mar 13 2007  12_OMAA.pt     12003
  353175 Jun 23 2006  12_OMAA.low    12004-8
  282540 Jul 31 2006  12_OMAA.mh     12009-12
  141270 Mar 29 2007  12_OMAA.mll    12013-14
```

[13_OMSA] Oc MY-SEASONAL Amt B5c fmt_121:

```
   70635 Jun 20 2005  13_OMSA.41.tc  13001
  353175 Jun 20 2005  13_OMSA.41.low 13002-6
  282540 Jul 27 2006  13_OMSA.41.mh  13007-10
  141270 Mar 29 2007  13_OMSA.41.mll 13011-12
   70635 Jun 20 2005  13_OMSA.42.tc  13013
  353175 Jun 20 2005  13_OMSA.42.low 13014-18
  282540 Jul 27 2006  13_OMSA.42.mh  13019-22
  141270 Mar 29 2007  13_OMSA.42.mll 13023-24
   70635 Apr 28 2006  13_OMSA.43.tc  13025
  353175 Apr 28 2006  13_OMSA.43.low 13026-30
  282540 Jul 27 2006  13_OMSA.43.mh  13031-34
  141270 Mar 29 2007  13_OMSA.43.mll 13035-36
   70635 Nov 16 2005  13_OMSA.44.tc  13037
  353175 Nov 16 2005  13_OMSA.44.low 13038-42
  282540 Jul 27 2006  13_OMSA.44.mh  13043-46
  141270 Mar 29 2007  13_OMSA.44.mll 13047-48
```

[14_OMSF] Oc MY-SEASONAL Fq B5c fmt_121:

```
   70635 Jun 22 2005  14_OMSF.41.cr  14001
   70635 Mar 12 2007  14_OMSF.41.pt  11002
  353175 Jun 23 2005  14_OMSF.41.low 14003-7
  282540 Aug  1 2006  14_OMSF.41.mh  14008-11
   70635 Jun 23 2005  14_OMSF.42.cr  14012
   70635 Mar 12 2007  14_OMSF.42.pt  14013
  353175 Jun 23 2005  14_OMSF.42.low 14014-18
  282540 Aug  1 2006  14_OMSF.42.mh  14019-22
   70635 May  1 2006  14_OMSF.43.cr  14023
   70635 Mar 12 2007  14_OMSF.43.pt  14024
  353175 May  1 2006  14_OMSF.43.low 14025-29
  282540 Apr 28 2006  14_OMSF.43.mh  14030-33
   70635 Nov 16 2005  14_OMSF.44.cr  14034
   70635 Mar 12 2007  14_OMSF.44.pt  14035
  353175 Nov 16 2005  14_OMSF.44.low 14036-40
  282540 Nov 16 2005  14_OMSF.44.mh  14041-44
```

[15_OMSW] Oc MY-SEASONAL AWP B5c fmt_121:

```
  282540 Jun 24 2005  15_OMSW.41.low 15001-4
  282540 Aug  2 2006  15_OMSW.41.mh  15005-8
  282540 Jun 23 2005  15_OMSW.42.low 15009-12
  282540 Aug  2 2006  15_OMSW.42.mh  15013-16
  282540 May  1 2006  15_OMSW.43.low 15017-20
  282540 May  1 2006  15_OMSW.43.mh  15021-24
  282540 Nov 10 2005  15_OMSW.44.low 15025-28
  282540 Nov 10 2005  15_OMSW.44.mh  15029-32
```

[15_O10W] Oc MY-SEASONAL AWP B510r fmt_121:

```
   76116 Sep  6 2005  15_O10W.41.low 15033-36
   76116 Sep  6 2005  15_O10W.41.mh  15037-40
   76116 Sep  6 2005  15_O10W.42.low 15041-44
   76116 Sep  6 2005  15_O10W.42.mh  15045-48
   76116 May  1 2006  15_O10W.43.low 15049-52
   76116 May  1 2006  15_O10W.43.mh  15053-56
   76116 Nov 10 2005  15_O10W.44.low 15057-60
   76116 Nov 10 2005  15_O10W.44.mh  15061-64
```

[16_OMSU] Oc MY-SEASONAL NOL B5c fmt_121:

```
  282540 Aug  2 2006  16_OMSU.41.mh  16001-4
  282540 Aug  2 2006  16_OMSU.42.mh  16005-8
  282540 May  1 2006  16_OMSU.43.mh  16009-12
  282540 Nov  9 2005  16_OMSU.44.mh  16013-16
```

[16_O10U] Oc MY-SEASONAL NOL B10r fmt_121:

```
   76116 Sep  6 2005  16_O10U.41.mh  16017-20
   76116 Sep  6 2005  16_O10U.42.mh  16021-24
   76116 May  1 2006  16_O10U.43.mh  16025-28
   76116 Nov  9 2005  16_O10U.44.mh  16029-32
```

[17_OMSH] Oc MY-SEASONAL Ht B5c fmt_122:
```
  282540 Jun 25 2005  17_OMSH.41.low 17001-4
  282540 Jun 25 2005  17_OMSH.42.low 17005-8
  282540 May  1 2006  17_OMSH.43.low 17009-12
  282540 Nov  9 2005  17_OMSH.44.low 17013-16
```
[17_O10H] Oc MY-SEASONAL Ht B10r fmt_122:
```
   76116 Sep  6 2005  17_O10H.41.low 17017-20
   76116 Sep  6 2005  17_O10H.42.low 17021-24
   76116 May  1 2006  17_O10H.43.low 17025-28
   76116 Nov  9 2005  17_O10H.44.low 17029-32
```
[18_OMMA] Oc MY-MONTHLY Amt B10r fmt_121:
```
   19029 Jun 22 2005  18_OMMA.01.tc  18001
   95145 May 16 2006  18_OMMA.01.low 18002-6
   76116 Jul 28 2006  18_OMMA.01.mh  18007-10
   19029 Jun 22 2005  18_OMMA.02.tc  18011
   95145 May 17 2006  18_OMMA.02.low 18012-16
   76116 Jul 28 2006  18_OMMA.02.mh  18017-20
   19029 Jun 22 2005  18_OMMA.03.tc  18021
   95145 May 17 2006  18_OMMA.03.low 18022-26
   76116 Jul 28 2006  18_OMMA.03.mh  18027-30
   19029 Jun 22 2005  18_OMMA.04.tc  18031
   95145 May 17 2006  18_OMMA.04.low 18032-36
   76116 Jul 28 2006  18_OMMA.04.mh  18037-40
   19029 Jun 22 2005  18_OMMA.05.tc  18041
   95145 May 17 2006  18_OMMA.05.low 18042-46
   76116 Jul 28 2006  18_OMMA.05.mh  18047-50
   19029 May  2 2006  18_OMMA.06.tc  18051
   95145 May 17 2006  18_OMMA.06.low 18052-56
   76116 May 17 2006  18_OMMA.06.mh  18057-60
   19029 May  2 2006  18_OMMA.07.tc  18061
   95145 May 17 2006  18_OMMA.07.low 18062-66
   76116 Jul 28 2006  18_OMMA.07.mh  18067-70
   19029 May  2 2006  18_OMMA.08.tc  18071
   95145 May 17 2006  18_OMMA.08.low 18072-76
   76116 Jul 28 2006  18_OMMA.08.mh  18077-80
   19029 Nov  3 2005  18_OMMA.09.tc  18081
   95145 May 18 2006  18_OMMA.09.low 18082-86
   76116 Jul 28 2006  18_OMMA.09.mh  18087-90
   19029 Oct 12 2005  18_OMMA.10.tc  18091
   95145 May 18 2006  18_OMMA.10.low 18092-96
   76116 Jul 28 2006  18_OMMA.10.mh  18097-100
   19029 Oct 20 2005  18_OMMA.11.tc  18101
   95145 May 18 2006  18_OMMA.11.low 18102-106
   76116 Jul 28 2006  18_OMMA.11.mh  18107-110
   19029 Jun 22 2005  18_OMMA.12.tc  18111
   95145 May 18 2006  18_OMMA.12.low 18112-116
   76116 Jul 28 2006  18_OMMA.12.mh  18117-120
```
[18_OMMA] Oc MY-SEASONAL Amt B10r fmt_121:
```
   19029 Jun 22 2005  18_OMMA.13.tc  18121
   95145 Jun 29 2005  18_OMMA.13.low 18122-26
   76116 Aug  2 2006  18_OMMA.13.mh  18127-30
   19029 Jun 22 2005  18_OMMA.14.tc  18131
   95145 Jun 29 2005  18_OMMA.14.low 18132-36
   76116 Aug  2 2006  18_OMMA.14.mh  18137-40
   19029 May  2 2006  18_OMMA.15.tc  18141
   95145 May  2 2006  18_OMMA.15.low 18142-46
   76116 May  2 2006  18_OMMA.15.mh  18147-50
   19029 Nov  4 2005  18_OMMA.16.tc  18151
   95145 Nov  4 2005  18_OMMA.16.low 18152-56
   76116 Jul 27 2006  18_OMMA.16.mh  18157-60
```
[19_OMMF] Oc MY-MONTHLY Fq B10r fmt_121:
```
   19029 Jun 25 2005  19_OMMF.01.cr  19001
   19029 Mar 14 2007  19_OMMF.01.pt  19002
   76116 May 19 2006  19_OMMF.01.low 19003-6
   76116 May 19 2006  19_OMMF.01.mh  19007-10
   19029 Jun 26 2005  19_OMMF.02.cr  19011
   19029 Mar 14 2007  19_OMMF.02.pt  19012
   76116 May 19 2006  19_OMMF.02.low 19013-16
   76116 May 19 2006  19_OMMF.02.mh  19017-20
   19029 Jun 26 2005  19_OMMF.03.cr  19021
   19029 Mar 14 2007  19_OMMF.03.pt  19022
   76116 May 19 2006  19_OMMF.03.low 19023-26
   76116 May 22 2006  19_OMMF.03.mh  19027-30
   19029 Jun 26 2005  19_OMMF.04.cr  19031
   19029 Mar 14 2007  19_OMMF.04.pt  19032
   76116 May 22 2006  19_OMMF.04.low 19033-36
   76116 May 22 2006  19_OMMF.04.mh  19037-40
   19029 Jun 26 2005  19_OMMF.05.cr  19041
   19029 Mar 14 2007  19_OMMF.05.pt  19042
   76116 May 22 2006  19_OMMF.05.low 19043-46
   76116 May 22 2006  19_OMMF.05.mh  19047-50
   19029 May  2 2006  19_OMMF.06.cr  19051
   19029 Mar 14 2007  19_OMMF.06.pt  19052
   76116 May 22 2006  19_OMMF.06.low 19053-56
   76116 May 22 2006  19_OMMF.06.mh  19057-60
   19029 May  2 2006  19_OMMF.07.cr  19061
   19029 Mar 14 2007  19_OMMF.07.pt  19062
   76116 May 22 2006  19_OMMF.07.low 19063-66
   76116 May 22 2006  19_OMMF.07.mh  19067-70
   19029 May  2 2006  19_OMMF.08.cr  19071
   19029 Mar 14 2007  19_OMMF.08.pt  19072
   76116 May 22 2006  19_OMMF.08.low 19073-76
   76116 May 22 2006  19_OMMF.08.mh  19077-80
   19029 Nov  3 2005  19_OMMF.09.cr  19081
   19029 Mar 14 2007  19_OMMF.09.pt  19082
   76116 May 22 2006  19_OMMF.09.low 19083-86
   76116 May 22 2006  19_OMMF.09.mh  19087-90
   19029 Oct 12 2005  19_OMMF.10.cr  19091
   19029 Mar 14 2007  19_OMMF.10.pt  19092
   76116 May 22 2006  19_OMMF.10.low 19093-96
   76116 May 22 2006  19_OMMF.10.mh  19097-100
   19029 Oct 20 2005  19_OMMF.11.cr  19101
   19029 Mar 14 2007  19_OMMF.11.pt  19102
   76116 May 22 2006  19_OMMF.11.low 19103-106
   76116 May 22 2006  19_OMMF.11.mh  19107-110
   19029 Jun 26 2005  19_OMMF.12.cr  19111
   19029 Mar 14 2007  19_OMMF.12.pt  19112
   76116 May 23 2006  19_OMMF.12.low 19113-116
   76116 May 23 2006  19_OMMF.12.mh  19117-120
```
[19_OMMF] Oc MY-SEASONAL Fq B10r fmt_121:
```
   19029 Jun 26 2005  19_OMMF.13.cr  19121
   19029 Mar 14 2007  19_OMMF.13.pt  19122
   76116 Jul  1 2005  19_OMMF.13.low 19123-26
   76116 Aug  2 2006  19_OMMF.13.mh  19127-30
   19029 Jun 26 2005  19_OMMF.14.cr  19131
   19029 Mar 14 2007  19_OMMF.14.pt  19132
   76116 Jul  1 2005  19_OMMF.14.low 19133-36
   76116 Aug  2 2006  19_OMMF.14.mh  19137-40
   19029 May  2 2006  19_OMMF.15.cr  19141
   19029 Mar 14 2007  19_OMMF.15.pt  19142
   76116 May  2 2006  19_OMMF.15.low 19143-46
   76116 May  2 2006  19_OMMF.15.mh  19147-50
   19029 Nov  4 2005  19_OMMF.16.cr  19151
   19029 Mar 14 2007  19_OMMF.16.pt  19152
   76116 Nov  7 2005  19_OMMF.16.low 19153-56
   76116 Nov  7 2005  19_OMMF.16.mh  19157-60
```

[20_OSAT] Oc MY-SN Amt by Hour B10r fmt_138:
```
   67909 Jul  5 2005  20_OSAT.41.tc  20001
  339545 Jul  5 2005  20_OSAT.41.low 20002-6
  271636 Aug  2 2006  20_OSAT.41.mh  20007-10
   67909 Jul  3 2005  20_OSAT.42.tc  20011
  339545 Jul  5 2005  20_OSAT.42.low 20012-16
  271636 Aug  2 2006  20_OSAT.42.mh  20017-20
   67909 May  3 2006  20_OSAT.43.tc  20021
  339545 May  3 2006  20_OSAT.43.low 20022-26
  271636 May  3 2006  20_OSAT.43.mh  20027-30
   67909 Nov 17 2005  20_OSAT.44.tc  20031
  339545 Nov 18 2005  20_OSAT.44.low 20032-36
  271636 Nov 18 2005  20_OSAT.44.mh  20037-40
```
[21_OSFT] Oc MY-SN Fq by Hour B10r fmt_138:
```
   67909 Jul 19 2005  21_OSFT.41.cr  21001
   67913 Mar 15 2007  21_OSFT.41.pt  21002
  271636 Mar 26 2007  21_OSFT.41.low 21003-6
  271636 Aug  2 2006  21_OSFT.41.mh  21007-10
   67909 Jul  8 2005  21_OSFT.42.cr  21011
   67913 Mar 15 2007  21_OSFT.42.pt  21012
  271636 Mar 26 2007  21_OSFT.42.low 21013-16
  271636 Aug  2 2006  21_OSFT.42.mh  21017-20
   67909 May  3 2006  21_OSFT.43.cr  21021
   67913 Mar 15 2007  21_OSFT.43.pt  21022
  271636 May  3 2006  21_OSFT.43.low 21023-26
  271636 May  3 2006  21_OSFT.43.mh  21027-30
```

```
   67909 Nov 21 2005  21_OSFT.44.cr  21031
   67913 Mar 15 2007  21_OSFT.44.pt  21032
  271636 Nov 18 2005  21_OSFT.44.low 21033-36
  271636 Nov 18 2005  21_OSFT.44.mh  21037-40

[22_OSUT]  Oc MY-SN NOL by Hour  B10r fmt_138:
  271636 Jul 20 2005  22_OSUT.41.mh  22001-4
  271636 Jul 20 2005  22_OSUT.42.mh  22005-8
  271636 May  4 2006  22_OSUT.43.mh  22009-12
  271636 Nov 21 2005  22_OSUT.44.mh  22013-16

[23_OSHT]  Oc MY-SN Ht by Hour  B10r fmt_139:
  271636 Jul 21 2005  23_OSHT.41.low 23001-4
  271636 Jul 21 2005  23_OSHT.42.low 23005-8
  271636 May  4 2006  23_OSHT.43.low 23009-12
  271636 Nov 21 2005  23_OSHT.44.low 23013-16
----------------------------------------------

[24_OHRM.aa] Oc Ann-Harmonic Amt B10r fmt_140:
   10949 Jun 14 2006  24_OHRM.aa.tc  24001
   54745 Jun 14 2006  24_OHRM.aa.low 24002-6
   43796 Jun 14 2006  24_OHRM.aa.mh  24007-10

[24_OHRM.af] Oc Ann-Harmonic Fq  B10r fmt_140:
   10949 Jun 14 2006  24_OHRM.af.cr  24011
   10949 Mar 15 2007  24_OHRM.af.pt  24012
   43796 Jun 15 2006  24_OHRM.af.mh  24017-20
----------------------------------------------

[24_OHRM.da] Oc Di-Harmonic Amt  B10r fmt_148:
   10949 Jul  7'05 24_OHRM.da.41.tc  24021
   54745 Jul  7'05 24_OHRM.da.41.low 24022-26
   43796 Aug  2'06 24_OHRM.da.41.mh  24027-30
   10949 Jul  7'05 24_OHRM.da.42.tc  24031
   54745 Jul  7'05 24_OHRM.da.42.low 24032-36
   43796 Aug  2'06 24_OHRM.da.42.mh  24037-40
   10949 May  4'06 24_OHRM.da.43.tc  24041
   54745 May  5'06 24_OHRM.da.43.low 24042-46
   43796 May  5'06 24_OHRM.da.43.mh  24047-50
   10949 Nov 30'05 24_OHRM.da.44.tc  24051
   54745 Dec  1'05 24_OHRM.da.44.low 24052-56
   43796 Dec  2'05 24_OHRM.da.44.mh  24057-60

[24_OHRM.df] Oc Di-Harmonic Fq  B10r fmt_148:
   10949 Jul 21'05 24_OHRM.df.41.cr  24061
   10949 Mar 16'07 24_OHRM.df.41.pt  24062
   43796 Jul 21'05 24_OHRM.df.41.low 24063-66
   43796 Aug  2'06 24_OHRM.df.41.mh  24067-70
   10949 Jul 21'05 24_OHRM.df.42.cr  24071
   10949 Mar 16'07 24_OHRM.df.42.pt  24072
   43796 Jul 21'05 24_OHRM.df.42.low 24073-76
   43796 Aug  2'06 24_OHRM.df.42.mh  24077-80
   10949 May  5'06 24_OHRM.df.43.cr  24081
   10949 Mar 16'07 24_OHRM.df.43.pt  24082
   43796 May  5'06 24_OHRM.df.43.low 24083-86
   43796 May  5'06 24_OHRM.df.43.mh  24087-90
   10949 Dec  2'05 24_OHRM.df.44.cr  24091
   10949 Mar 16'07 24_OHRM.df.44.pt  24092
   43796 Dec  2'05 24_OHRM.df.44.low 24093-96
   43796 Dec  2'05 24_OHRM.df.44.mh  24097-100

[24_OHRM.dh] Oc Di-Harmonic Ht B10r fmt_149:
   43796 Jul 22'05 24_OHRM.dh.41.low 24101-4
   43796 Jul 22'05 24_OHRM.dh.42.low 24105-8
   43796 May  8'06 24_OHRM.dh.43.low 24109-112
   43796 Dec  2'05 24_OHRM.dh.44.low 24113-116
-----------------------------------------------

[25-28_OSMA]  Oc SN-YRs Amts  B10r fmt_226:
  910657 May 23 2005  25_OSMA.41.tc  25001
  910657 May 24 2005  25_OSMA.41.Fo  25002
  910657 May 24 2005  25_OSMA.41.St  25003
  910657 May 24 2005  25_OSMA.41.Sc  25004
  910657 May 24 2005  25_OSMA.41.Cu  25005
  910657 May 24 2005  25_OSMA.41.Cb  25006
  910657 Jul 18 2006  25_OSMA.41.Ns  25007
  910657 Jul 18 2006  25_OSMA.41.As  25008
  910657 Jul 18 2006  25_OSMA.41.Ac  25009
  910657 Jul 18 2006  25_OSMA.41.Hi  25010

  910657 May 23 2005  26_OSMA.42.tc  26001
  910657 May 24 2005  26_OSMA.42.Fo  26002
  910657 May 24 2005  26_OSMA.42.St  26003
  910657 May 24 2005  26_OSMA.42.Sc  26004
  910657 May 24 2005  26_OSMA.42.Cu  26005
  910657 May 24 2005  26_OSMA.42.Cb  26006
  910657 Jul 20 2006  26_OSMA.42.Ns  26007
  910657 Jul 20 2006  26_OSMA.42.As  26008
  910657 Jul 20 2006  26_OSMA.42.Ac  26009
  910657 Jul 19 2006  26_OSMA.42.Hi  26010

  910657 May 11 2006  27_OSMA.43.tc  27001
  910657 May 11 2006  27_OSMA.43.Fo  27002
  910657 May 11 2006  27_OSMA.43.St  27003
  910657 May 11 2006  27_OSMA.43.Sc  27004
  910657 May 12 2006  27_OSMA.43.Cu  27005
  910657 May 12 2006  27_OSMA.43.Cb  27006
  910657 Jul 20 2006  27_OSMA.43.Ns  27007
  910657 Jul 21 2006  27_OSMA.43.As  27008
  910657 Jul 21 2006  27_OSMA.43.Ac  27009
  910657 Jul 24 2006  27_OSMA.43.Hi  27010

  910657 Dec 30 2005  28_OSMA.44.tc  28001
  910657 Jan  4 2006  28_OSMA.44.Fo  28002
  910657 Jan  4 2006  28_OSMA.44.St  28003
  910657 Jan  4 2006  28_OSMA.44.Sc  28004
  910657 Jan  4 2006  28_OSMA.44.Cu  28005
  910657 Jan  4 2006  28_OSMA.44.Cb  28006
  910657 Jul 25 2006  28_OSMA.44.Ns  28007
  910657 Jul 25 2006  28_OSMA.44.As  28008
  910657 Jul 25 2006  28_OSMA.44.Ac  28009
  910657 Jul 24 2006  28_OSMA.44.Hi  28010

[29-32_OSMF]  Oc SN-YRs Fqs  B10r fmt_226:
  910657 Jul 29 2005  29_OSMF.41.cr  29001
  910657 Jul 29 2005  29_OSMF.41.Fo  29002
  910657 Jul 29 2005  29_OSMF.41.St  29003
  910657 Jul 29 2005  29_OSMF.41.Sc  29004
  910657 Jul 29 2005  29_OSMF.41.Cu  29005
  910657 Jul 29 2005  29_OSMF.41.Cb  29006
  910657 Jul 29 2005  29_OSMF.41.Ns  29007
  910657 Jul 29 2005  29_OSMF.41.As  29008
  910657 Jul 29 2005  29_OSMF.41.Ac  29009
  910657 Jul 28 2005  29_OSMF.41.Hi  29010

  910657 Oct 15 2004  30_OSMF.42.cr  30001
  910657 Oct 18 2004  30_OSMF.42.Fo  30002
  910657 Oct 18 2004  30_OSMF.42.St  30003
  910657 Oct 12 2004  30_OSMF.42.Sc  30004
  910657 Oct 18 2004  30_OSMF.42.Cu  30005
  910657 Oct 18 2004  30_OSMF.42.Cb  30006
  910657 Oct 13 2004  30_OSMF.42.Ns  30007
  910657 Oct 13 2004  30_OSMF.42.As  30008
  910657 Oct 13 2004  30_OSMF.42.Ac  30009
  910657 Oct 12 2004  30_OSMF.42.Hi  30010

  910657 May 15 2006  31_OSMF.43.cr  31001
  910657 May 15 2006  31_OSMF.43.Fo  31002
  910657 May 15 2006  31_OSMF.43.St  31003
  910657 May 15 2006  31_OSMF.43.Sc  31004
  910657 May 15 2006  31_OSMF.43.Cu  31005
  910657 May 15 2006  31_OSMF.43.Cb  31006
  910657 May 15 2006  31_OSMF.43.Ns  31007
  910657 May 15 2006  31_OSMF.43.As  31008
  910657 May 15 2006  31_OSMF.43.Ac  31009
  910657 May 15 2006  31_OSMF.43.Hi  31010

  910657 Jan  5 2006  32_OSMF.44.cr  32001
  910657 Jan  5 2006  32_OSMF.44.Fo  32002
  910657 Jan  5 2006  32_OSMF.44.St  32003
  910657 Jan  5 2006  32_OSMF.44.Sc  32004
  910657 Jan  5 2006  32_OSMF.44.Cu  32005
  910657 Jan  5 2006  32_OSMF.44.Cb  32006
  910657 Jan  5 2006  32_OSMF.44.Ns  32007
  910657 Jan  5 2006  32_OSMF.44.As  32008
  910657 Jan  5 2006  32_OSMF.44.Ac  32009
  910657 Jan  5 2006  32_OSMF.44.Hi  32010

[33-36_OSMU]  Oc SN-YRs NOL  B10r fmt_226:
  910657 Jul 29 2005  33_OSMU.41.Ns  33001
  910657 Jul 29 2005  33_OSMU.41.As  33002
  910657 Jul 29 2005  33_OSMU.41.Ac  33003
  910657 Jul 29 2005  33_OSMU.41.Hi  33004

  910657 Oct 28 2004  34_OSMU.42.Ns  34001
  910657 Oct 20 2004  34_OSMU.42.As  34002
  910657 Oct 20 2004  34_OSMU.42.Ac  34003
```

```
  910657 Oct 20 2004  34_OSMU.42.Hi  34004

  910657 May 12 2006  35_OSMU.43.Ns  35001
  910657 May 12 2006  35_OSMU.43.As  35002
  910657 May 15 2006  35_OSMU.43.Ac  35003
  910657 May 15 2006  35_OSMU.43.Hi  35004

  910657 Jan  6 2006  36_OSMU.44.Ns  36001
  910657 Jan  6 2006  36_OSMU.44.As  36002
  910657 Jan  6 2006  36_OSMU.44.Ac  36003
  910657 Jan  6 2006  36_OSMU.44.Hi  36004
```

[37-40_OSMH] Oc SN-YRs Ht B10r fmt_227:

```
  910657 Aug  1 2005  37_OSMH.41.St  37001
  910657 Aug  1 2005  37_OSMH.41.Sc  37002
  910657 Aug  1 2005  37_OSMH.41.Cu  37003
  910657 Aug  1 2005  37_OSMH.41.Cb  37004

  910657 Nov  1 2004  38_OSMH.42.St  38001
  910657 Nov  2 2004  38_OSMH.42.Sc  38002
  910657 Nov  2 2004  38_OSMH.42.Cu  38003
  910657 Nov  2 2004  38_OSMH.42.Cb  38004

  910657 May 12 2006  39_OSMH.43.St  39001
  910657 May 12 2006  39_OSMH.43.Sc  39002
  910657 May 12 2006  39_OSMH.43.Cu  39003
  910657 May 12 2006  39_OSMH.43.Cb  39004

  910657 Jan  6 2006  40_OSMH.44.St  40001
  910657 Jan  6 2006  40_OSMH.44.Sc  40002
  910657 Jan  6 2006  40_OSMH.44.Cu  40003
  910657 Jan  6 2006  40_OSMH.44.Cb  40004
----------------------------------------
```

[41-52_OMYD] Oc MN-YRs-Dy AFW B10r fmt_162:

```
  622201 Oct 20 2006  41_OMYD.01.tc  41001
  622201 Oct 20 2006  41_OMYD.01.cr  41002
  622201 Oct 20 2006  41_OMYD.01.Fo  41003
  622201 Oct 20 2006  41_OMYD.01.St  41004
  622201 Oct 20 2006  41_OMYD.01.Sc  41005
  622201 Oct 20 2006  41_OMYD.01.Cu  41006
  622201 Oct 23 2006  41_OMYD.01.Cb  41007
  622201 Oct 23 2006  41_OMYD.01.Ns  41008
  622201 Oct 23 2006  41_OMYD.01.As  41009
  622201 Oct 23 2006  41_OMYD.01.Ac  41010
  622201 Oct 23 2006  41_OMYD.01.Hi  41011

  622201 Nov 21 2006  42_OMYD.02.tc  42001
  622201 Nov 28 2006  42_OMYD.02.cr  42002
  622201 Nov 28 2006  42_OMYD.02.Fo  42003
  622201 Nov 28 2006  42_OMYD.02.St  42004
  622201 Nov 28 2006  42_OMYD.02.Sc  42005
  622201 Nov 28 2006  42_OMYD.02.Cu  42006
  622201 Nov 28 2006  42_OMYD.02.Cb  42007
  622201 Nov 28 2006  42_OMYD.02.Ns  42008
  622201 Nov 28 2006  42_OMYD.02.As  42009
  622201 Nov 28 2006  42_OMYD.02.Ac  42010
  622201 Nov 28 2006  42_OMYD.02.Hi  42011

  622201 Dec 27 2006  43_OMYD.03.tc  43001
  622201 Dec 27 2006  43_OMYD.03.cr  43002
  622201 Dec 28 2006  43_OMYD.03.Fo  43003
  622201 Dec 28 2006  43_OMYD.03.St  43004
  622201 Dec 28 2006  43_OMYD.03.Sc  43005
  622201 Dec 28 2006  43_OMYD.03.Cu  43006
  622201 Dec 28 2006  43_OMYD.03.Cb  43007
  622201 Dec 29 2006  43_OMYD.03.Ns  43008
  622201 Dec 29 2006  43_OMYD.03.As  43009
  622201 Dec 29 2006  43_OMYD.03.Ac  43010
  622201 Dec 29 2006  43_OMYD.03.Hi  43011

  622201 Sep 29 2006  44_OMYD.04.tc  44001
  622201 Sep 29 2006  44_OMYD.04.cr  44002
  622201 Sep 29 2006  44_OMYD.04.Fo  44003
  622201 Sep 29 2006  44_OMYD.04.St  44004
  622201 Sep 29 2006  44_OMYD.04.Sc  44005
  622201 Sep 29 2006  44_OMYD.04.Cu  44006
  622201 Sep 29 2006  44_OMYD.04.Cb  44007
  622201 Sep 29 2006  44_OMYD.04.Ns  44008
  622201 Sep 29 2006  44_OMYD.04.As  44009
  622201 Sep 29 2006  44_OMYD.04.Ac  44010
  622201 Sep 29 2006  44_OMYD.04.Hi  44011

  622201 Jan 10 2007  45_OMYD.05.tc  45001
  622201 Jan 10 2007  45_OMYD.05.cr  45002
  622201 Jan 11 2007  45_OMYD.05.Fo  45003
  622201 Jan 11 2007  45_OMYD.05.St  45004
  622201 Jan 11 2007  45_OMYD.05.Sc  45005
  622201 Jan 11 2007  45_OMYD.05.Cu  45006
  622201 Jan 11 2007  45_OMYD.05.Cb  45007
  622201 Jan 12 2007  45_OMYD.05.Ns  45008
  622201 Jan 12 2007  45_OMYD.05.As  45009
  622201 Jan 12 2007  45_OMYD.05.Ac  45010
  622201 Jan 12 2007  45_OMYD.05.Hi  45011

  622201 Nov  9 2006  46_OMYD.06.tc  46001
  622201 Nov  9 2006  46_OMYD.06.cr  46002
  622201 Nov  9 2006  46_OMYD.06.Fo  46003
  622201 Nov  9 2006  46_OMYD.06.St  46004
  622201 Nov  9 2006  46_OMYD.06.Sc  46005
  622201 Nov  9 2006  46_OMYD.06.Cu  46006
  622201 Nov  9 2006  46_OMYD.06.Cb  46007
  622201 Nov 10 2006  46_OMYD.06.Ns  46008
  622201 Nov 10 2006  46_OMYD.06.As  46009
  622201 Nov 10 2006  46_OMYD.06.Ac  46010
  622201 Nov 10 2006  46_OMYD.06.Hi  46011

  622201 May 31 2006  47_OMYD.07.tc  47001
  622201 May 31 2006  47_OMYD.07.cr  47002
  622201 May 31 2006  47_OMYD.07.Fo  47003
  622201 May 31 2006  47_OMYD.07.St  47004
  622201 Jun  1 2006  47_OMYD.07.Sc  47005
  622201 Jun  1 2006  47_OMYD.07.Cu  47006
  622201 Jun  1 2006  47_OMYD.07.Cb  47007
  622201 Jun  1 2006  47_OMYD.07.Ns  47008
  622201 Jun  1 2006  47_OMYD.07.As  47009
  622201 Jun  1 2006  47_OMYD.07.Ac  47010
  622201 Jun  1 2006  47_OMYD.07.Hi  47011

  622201 Jun  6 2006  48_OMYD.08.tc  48001
  622201 Jun  6 2006  48_OMYD.08.cr  48002
  622201 Jun  6 2006  48_OMYD.08.Fo  48003
  622201 Jun  6 2006  48_OMYD.08.St  48004
  622201 Jun  6 2006  48_OMYD.08.Sc  48005
  622201 Jun  7 2006  48_OMYD.08.Cu  48006
  622201 Jun  7 2006  48_OMYD.08.Cb  48007
  622201 Jun  7 2006  48_OMYD.08.Ns  48008
  622201 Jun  7 2006  48_OMYD.08.As  48009
  622201 Jun  7 2006  48_OMYD.08.Ac  48010
  622201 Jun  7 2006  48_OMYD.08.Hi  48011

  622201 Jan 19 2007  49_OMYD.09.tc  49001
  622201 Jan 19 2007  49_OMYD.09.cr  49002
  622201 Jan 22 2007  49_OMYD.09.Fo  49003
  622201 Jan 22 2007  49_OMYD.09.St  49004
  622201 Jan 22 2007  49_OMYD.09.Sc  49005
  622201 Jan 22 2007  49_OMYD.09.Cu  49006
  622201 Jan 23 2007  49_OMYD.09.Cb  49007
  622201 Jan 23 2007  49_OMYD.09.Ns  49008
  622201 Jan 23 2007  49_OMYD.09.As  49009
  622201 Jan 23 2007  49_OMYD.09.Ac  49010
  622201 Jan 23 2007  49_OMYD.09.Hi  49011

  622201 Oct 31 2006  50_OMYD.10.tc  50001
  622201 Oct 31 2006  50_OMYD.10.cr  50002
  622201 Oct 31 2006  50_OMYD.10.Fo  50003
  622201 Oct 31 2006  50_OMYD.10.St  50004
  622201 Nov  1 2006  50_OMYD.10.Sc  50005
  622201 Nov  1 2006  50_OMYD.10.Cu  50006
  622201 Nov  1 2006  50_OMYD.10.Cb  50007
  622201 Nov  1 2006  50_OMYD.10.Ns  50008
  622201 Nov  1 2006  50_OMYD.10.As  50009
  622201 Nov  1 2006  50_OMYD.10.Ac  50010
  622201 Nov  1 2006  50_OMYD.10.Hi  50011

  622201 Jan 31 2007  51_OMYD.11.tc  51001
  622201 Jan 31 2007  51_OMYD.11.cr  51002
  622201 Jan 31 2007  51_OMYD.11.Fo  51003
  622201 Feb  1 2007  51_OMYD.11.St  51004
  622201 Feb  1 2007  51_OMYD.11.Sc  51005
  622201 Feb  1 2007  51_OMYD.11.Cu  51006
  622201 Feb  1 2007  51_OMYD.11.Cb  51007
  622201 Feb  1 2007  51_OMYD.11.Ns  51008
  622201 Feb  1 2007  51_OMYD.11.As  51009
  622201 Feb  1 2007  51_OMYD.11.Ac  51010
  622201 Feb  1 2007  51_OMYD.11.Hi  51011

  622201 Feb  8 2007  52_OMYD.12.tc  52001
```

622201	Feb	8	2007	52_OMYD.12.cr	52002
622201	Feb	8	2007	52_OMYD.12.Fo	52003
622201	Feb	9	2007	52_OMYD.12.St	52004
622201	Feb	9	2007	52_OMYD.12.Sc	52005
622201	Feb	9	2007	52_OMYD.12.Cu	52006
622201	Feb	9	2007	52_OMYD.12.Cb	52007
622201	Feb	9	2007	52_OMYD.12.Ns	52008
622201	Feb	9	2007	52_OMYD.12.As	52009
622201	Feb	9	2007	52_OMYD.12.Ac	52010
622201	Feb	9	2007	52_OMYD.12.Hi	52011

bytes datewritten File_Name DGRPs
(Gridded Cloud Archive, NDP-026E)

ANCILLARY FILES FOR OCEAN

bytes	datewritten			File_Name	seq.Num.
15997	Apr	26	2007	B10NYRS.01jan	00001
15997	Apr	26	2007	B10NYRS.02feb	00002
15997	Apr	26	2007	B10NYRS.03mar	00003
15997	Apr	26	2007	B10NYRS.04apr	00004
15997	Apr	26	2007	B10NYRS.05may	00005
15997	Apr	26	2007	B10NYRS.06jun	00006
15997	Apr	26	2007	B10NYRS.07jul	00007
15997	Apr	26	2007	B10NYRS.08aug	00008
15997	Apr	26	2007	B10NYRS.09sep	00009
15997	Apr	26	2007	B10NYRS.10oct	00010
15997	Apr	26	2007	B10NYRS.11nov	00011
15997	Apr	26	2007	B10NYRS.12dec	00012
15997	Apr	26	2007	B10NYRS.13djf	00013
15997	Apr	26	2007	B10NYRS.14mam	00014
15997	Apr	26	2007	B10NYRS.15jja	00015
15997	Apr	26	2007	B10NYRS.16son	00016

APPENDIX U. OCEAN CLOUD UPDATE, 1998-2008, APPENDED TO

A GRIDDED CLIMATOLOGY OF CLOUDS OVER LAND (1971-96) AND OCEAN (1954-97) FROM SURFACE OBSERVATIONS WORLDWIDE

NDP-026E

December 2007
Updated December 2009

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CONTENTS

U-1. HISTORY

This note is an appendix to the original documentation for "A Gridded Climatology of Clouds Over Land (1971-96) and Ocean (1954-97 from Surface Observations Worldwide" (H07: Hahn & Warren, 2007). This documentation (and any desired data) may be obtained from:

Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory
Post Office Box 2008
Oak Ridge, TN 37831-6335, U.S.A.
Telephone (423) 574-3645
(http://cdiac.esd.ornl.gov/epubs/ndp/ndp026e/ndp026e.html)

The documentation is also available from our website: http://www.atmos.washington.edu/CloudMap/.

Surface synoptic weather reports from ships and land stations worldwide (Hahn & Warren, 1999) were processed to produce a global cloud climatology which includes: total cloud cover, the amount and frequency of occurrence of nine cloud types within three levels of the troposphere, the frequency of occurrence of clear sky and of precipitation, the base heights of low clouds, and the non-overlapped amounts of middle and high clouds. The first release of these data covered the years 1971-1996 for land data and 1954-1997 for ship data. There is no need to update the long-term averages provided in that release, but cloud cover averages for the individual years (monthly or seasonally) are needed to study trends and interannual variations of clouds. This report describes the update from ship data for the years 1998 to 2008, thus making available 55 years of cloud averages over the oceans.

U-2. FORMATs for the 1998-2008 Update to the Gridded Cloud Climatology over Oceans

Table 5b-Update provided here mimics Table 5b in H07 (see Table 7 of H07 for glossary of terms). In particular, the File Categories 55-82 here are 11-year extensions to the original FCs 25-52, respectively. (FCs of the updates are labeled as original FC number plus 30 for convenience of comparison.)

The data formats for the 1998-2008 update files are the same as for the original files (formats 226, 227, 162 and the header record are defined in Table 6 of H07). Here there will be only 11 data records (one per year) for each grid box, rather than 44 or 46. Since the year is given to only two digits, it must be recognized that for values at or above 50 one must add 1900 and for values below 50 one must add 2000 to get the 4-digit year.

As before, there are also Ancillary Files (Sec. 6.1.1 of H07) which show the number of years contributing a minimum of 25 observations (for a season) or 20 observations (for a month) to a box (format 211; see Tables 6b and 8b of H07). These files will be named just as the original files (eg B10NYRS.01jan) but with a "u" for "update" added to the name (eg B10NYRS.01janu) to distinguish the two.

U-3. EXAMPLES from Data Files of Individual Year-Season Averages

Table 8t in H07 showed an example for cumulus cloud amount for MAMs (file name 26_OSMA.42.Cu; *see Errata below*) in B10r 278 (a 10x10deg lat x lon grid box on the north coast of Australia). Below are shown the corresponding update years from the update file named 56_OSMA.42.Cu (labels added).

```
56005  404 10 2 14 1 9808 42 226  25
 278 98    156  1571      0-90000    169  1566 3
 278 99     85  1160      0-90000    100  1018 3
 278 00     64  1992      0-90000     74  2061 3
 278 01     92  1821      0-90000     97  1817 3
 278 02     87  1782      0-90000    104  1550 3
 278 03    341  1426     61  1496    402  1461 2
 278 04    202  1033     32  1367    234  1200 2
 278 05    171  1732     41  1829    212  1781 2
 278 06    209  1275     58  1142    267  1209 2
 278 07    171  2032     83  1220    254  1626 2
 278 08     84  1533     25  1800    109  1666 2
B10R YR    NobD  AvgD    NobN  AvgN  NobDN AvgDN Acode
```

This example shows the data years continuing consecutively beyond 1997. Also, the 2-digit year display is evident in the YR variable and in the header where "9808" signifies "1998 to 2008".

Table 8u in H07 also showed an example for high cloud (daytime amount, frequency, & amount-when-present) for Aprils (file name 44_OMYD.04.Hi; *see Errata below*) in B10r 31 (a 10x20deg grid box covering the North Sea). Below are shown the corresponding update years from the update file named 74_OMYD.04.Hi.

```
74011  404 10 2 30 0 9808 04 162  20  15
   31 98 796  2289  5943  3851 247
   31 99 793  1268  4441  2854 200
   31 00 377  1478  4711  3137 127
   31 01 595  1482  4422  3351 195
   31 02 438  1350  3714  3635 127
   31 03 553  1608  5018  3204 217
   31 04 368  1688  5193  3251 135
   31 05 317  1771  5231  3385 125
   31 06 271  1238  4152  2981  65
   31 07 306  1423  3869  3678  90
   31 08 278  1575  4764  3306  71
 B10R YR NobD AmtD   FqD  AWPd NCd
```

This is the grid box with the most observations, but it is evident that far fewer observations are recorded in the more recent years.

Errata: Note that Table 8 (examples t and u) of H07 contains a small error in each of these examples: "26_OSMA.42.low" should read "26_OSMA.42.Cu"; and "44_OSMA.04.Hi" should read "44_OMYD.04.Hi".

U-4. FUTURE Updates of the Gridded Cloud Climatology

Ship data. We have no plans to further update the gridded climatology from ship data, but steps have been taken to include an "ECR Attachment" to the ICOADS ship reports that contain cloud information (Worley et al., 2005). Thus a uniform source of ship observations may be available to others who wish to extend the years of cloud cover averages over oceans.

Land data problems. The EECRA (H99) currently contains cloud reports from land stations through 1996. Because of changes in procedures at NCEP and requirements by the WMO, as well as the automation of many land stations, there are problems with available land data that have not yet been resolved. Thus an update of the land data part of the cloud averages climatology is still pending. (Yearly land cloud cover averages were not included in the gridded data set, but were provided for individual stations in H03.)

REFERENCES

(H07) Hahn, C.J., and S.G. Warren, 2007: *A Gridded Climatology of Clouds over Land (1971-96) and Ocean (1954-97) from Surface Observations Worldwide*. NDP-026E, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, TN. (Documentation, 71 pages.) http://cdiac.ornl.gov/epubs/ndp/ndp026e/ndp026e.html (Includes 2009 update extending ship data to 2008.)

(H03) Hahn, C.J., and S.G. Warren, 2003: *Cloud climatology for land stations worldwide, 1971-1996.* NDP-026D, Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory, Oak Ridge, TN. (Documentation, 35 pages.)

(H99) Hahn, C.J., and S.G. Warren, 1999: *Extended Edited Synoptic Cloud Reports from Ships and Land Stations Over the Globe, 1952-1996*. NDP-026C, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, TN (Documentation 79 pages) http://cdiac.ornl.gov/epubs/ndp/ndp026c/ndp026c.html (Includes 2009 update extending ship data to 2008.)

Worley, S.J., S.D. Woodruff, R.W. Reynolds, S.J. Lubker, and N. Lott, 2005: ICOADS Release 2.1 data and products. *Int. J. Climatol. (CLIMAR-II Special Issue)*, **25**, 823-842 (DOI: 10.1002/joc.1166). *(see http://icoads.noaa.gov/)*

TABLE 5b-Update. DATA ORGANIZATION for Gridded *OCEAN* Cloud Archive; ***Update Years 1998-2008***[&].

Seasonal-Mean[#] **AVERAGES OCEAN, 10r** Grid (404 B10r's)

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
55-58	10*4	55001-58010	Seasonal-Mean <u>Cloud AMOUNT</u>	(OSMA)	226

FC	AMT:	TC	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
55	DJF	1	2	3	4	5	6	7	8	9	10
56	MAM	1	2	3	4	5	6	7	8	9	10
57	JJA	1	2	3	4	5	6	7	8	9	10
58	SON	1	2	3	4	5	6	7	8	9	10

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
59-62	10*4	59001-62010	Seasonal-Mean <u>Cloud FREQUENCY</u>	(OSMF)	226

FC	FQ:	Cr	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
59	DJF	1	2	3	4	5	6	7	8	9	10
60	MAM	1	2	3	4	5	6	7	8	9	10
61	JJA	1	2	3	4	5	6	7	8	9	10
62	SON	1	2	3	4	5	6	7	8	9	10

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
63-66	4*4	63001-63004	Seasonal-Mean <u>NOL Amount</u>	(OSMU)	226

FC	NOL:	Ns	As	Ac	Hi
63	DJF	1	2	3	4
64	MAM	1	2	3	4
65	JJA	1	2	3	4
66	SON	1	2	3	4

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
67-70	4*4	67001-70004	Seasonal-Mean <u>BASE HEIGHT</u>	(OSMH)	227

FC	HGT:	St	Sc	Cu	Cb
67	DJF	1	2	3	4
68	MAM	1	2	3	4
69	JJA	1	2	3	4
70	SON	1	2	3	4

Monthly-Mean[#] Daytime **AVERAGES OCEAN, 10r** Grid (404 B10r's)

FC	#BGRPs	BGRP#s	Contents	(Abbrev.)	fmt
71-82	11*12	71001-82011	Monthly-Mean,Dy <u>Cloud Amt,Fq,AWP</u>	(OMYD)	162

FC	AFW:	TC	Cr	Fo	St	Sc	Cu	Cb	Ns	As	Ac	Hi
71	Jan	1	2	3	4	5	6	7	8	9	10	11
72	Feb	1	2	3	4	5	6	7	8	9	10	11
73	Mar	1	2	3	4	5	6	7	8	9	10	11
74	Apr	1	2	3	4	5	6	7	8	9	10	11
75	May	1	2	3	4	5	6	7	8	9	10	11
76	Jun	1	2	3	4	5	6	7	8	9	10	11
77	Jul	1	2	3	4	5	6	7	8	9	10	11
78	Aug	1	2	3	4	5	6	7	8	9	10	11
79	Sep	1	2	3	4	5	6	7	8	9	10	11
80	Oct	1	2	3	4	5	6	7	8	9	10	11
81	Nov	1	2	3	4	5	6	7	8	9	10	11
82	Dec	1	2	3	4	5	6	7	8	9	10	11

& FCs 55- 70 and 71-82 add years 1998-2008 to FCs 25-40 (1952-1997) and 41-52 (1954-1997), respectively.
* "Mean-annual", "mean-seasonal", and "mean-monthly" signify multi-year averages.
\# "Seasonal-mean" and "monthly-mean" signify individual-year averages.